current temporal attention work in the lab

Alex O. Holcombe

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Abstract

Applicants to the lab postdoc / advanced RA position wanna know what they'd be in for if they took the job. Below are some recent conference abstracts from the lab, along the lines of the funded project. **In Multiple Object Tracking, At High Speeds One May Only Be Able To Track A Single Target—Even If No Crowding Occurs** Alex Holcombe, Wei-Ying Chen

Keywords

Cognitive Neuroscience (Subfield), Holcombe Lab, Perception

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In Multiple Object Tracking, At High Speeds One May Only Be Able To Track A Single Target—Even If No Crowding Occurs

Alex Holcombe, Wei-Ying Chen [VSS 2011 abstract]

To assess the speed limit for tracking moving objects with attention, first some blobs are designated as targets, then they and other identical blobs travel about. After a variable tracking period, participants must indicate which blobs had been designated as targets. If more blobs are designated for tracking, the maximum speed yielding accurate performance decreases. However, Franconeri et al. (2008; 2010) suggested that the decrease in high-speed performance with more targets is entirely attributable to crowding—in most studies, at higher speeds objects pass near each other more frequently. We assessed the speed limit for tracking one and for tracking two targets. In each of two concentric circular trajectories, two blobs traveled. Within a trajectory, the two blobs were always on opposite sides of fixation. One blob in one trajectory (one-target condition) or one blob in each trajectory (two-target condition) was precued. Separation between the trajectories was varied to assess any effect of crowding. RESULTS. The average speed limit (68% threshold) of six participants was substantially higher for tracking one target (1.9 rps) than for tracking two targets (1.5 rps), even when crowding was avoided with large separation. The slowness of the two-target limit found is similar to that predicted (1.6 rps) if each participant tracked only one target at high speeds, guessing when they picked the wrong one to track. To further investigate what causes the speed limits, we exploited the finding of hemisphere-specific tracking resources (Alvarez & Cavanagh 2005). Two targets were in either the same hemifield or different hemifields. The speed limit was significantly slower (six participants) for targets in the same hemifield than in opposite hemifields, consistent with the involvement of independent resources. Availability of such resources may set the severe speed limits on tracking documented here.

Time to contact does not pop out

Eli Brenner & Alex Holcombe [VSS 2011 abstract]

In visual search, items differing markedly from the others in a basic visual feature are quickly localized, irrespective of the number of distracters. Is time to contact such a basic visual feature? This question cannot be answered with conventional search tasks because time to contact necessarily changes continuously. We therefore developed two alternative tasks in which items converged towards a single point. In the first, before reaching the point, all items disappeared simultaneously. Participants indicated which they thought would have reached the point first. The items were assigned random speeds, with initial distance set so all except the target would have reached the point at the same time. The number of items strongly influenced the difference in time to contact required for the target to be picked reliably. Performance was only slightly better than if participants had simply picked the item that was nearest to the point when the items

disappeared. On half the trials of the second experiment one item had a shorter time to contact than the others and on the other half all items had the same time to contact. Participants indicated as quickly as possible whether all items would arrive at the same time. Reaction time hardly depended on the number of items, but on average participants did not respond until the target's time to contact was less than half that of the other items. For trials with no target, they usually did not respond until when a target would have arrived. The results were similar for simulated motion towards the participant. When the speed heterogeneity was eliminated to make proximity a reliable cue, search was much faster. Apparently having a shorter time to contact does not make an item easy to detect. How then do we cross a busy intersection or negotiate a busy plaza?

Inability to perceive the spatial relationship of objects revolving too quickly to attentively track

Alex Holcombe[1], Daniel Linares[1], Maryam Vaziri-Pashkam[2] [VSS 2010 abstract]

[1]*School of Psychology, University of Sydney*

[2]*Department of Psychology, Harvard University*

What is perception missing when one cannot attentively track? To find out, we exploit the finding that an object revolving about fixation faster than 1.5 revolutions per second (rps) cannot be tracked (Verstraten, Cavanagh, Labianca 2000). METHODS. Six Gaussian blobs were evenly spaced along a circular orbit (radius 2 deg). Three colors were used in two identically-ordered triplets, e.g. red-green-cyan-red-green-cyan. The triplet of colors was chosen pseudorandomly on each trial. The blobs moved for three seconds. Observers fixated the center of the rotating ring and subsequently attempted to report the colors' relative order. In a second experiment, an outer (radius 4 deg) ring of blobs with three new colors, e.g. yellow-blue-fuchsia-yellow-blue-fuchsia, was added. Each blob in the inner ring was aligned with another in the outer ring and observers judged, for any color they chose of the inner ring, which color was aligned with it in the outer ring. In an identification control experiment, observers reported which colors were presented. To confirm the tracking limit, with all blobs set to the same color observers were cued to track one blob and at the end are tested on which blob it was. RESULTS. Observers could identify the colors (>90% correct) at rates over 2.5 rps. The limit on attentive tracking was much lower with average 75% threshold <1.5 rps. For the two experiments eliciting judgments of spatial relationships, 75% threshold rates were again 1.5 rps or lower and participants were near chance at rates for which the colors could easily be identified. Indeed, when viewing the display rotating at 2 rps, most observers are struck by their inability to grasp the relative location of any two colors, despite clear perception of the colors' identity. CONCLUSIONS. Coordinated individuation by attention may be necessary to extract most spatial relationships.