Where is as important as when

W.D. KEARNS. ***Location, location, location: Where is as important as when.*** *Gerontechnology 2016;15(suppl);110s*: doi:10.4017/gt.2016.15.s.627.00 **Purpose** Advances in behavioral science and medicine in the last century owe much to the precise measurement of 'time'. Chronometers and stopwatches allow measurement of human reaction times and response latencies to very high accuracies. Yet, ironically, the invention of extremely precise timepieces also propels the advancement of the measurement of 'space' via global positioning systems, and more recently indoor real time location system tracking tools that have been developed using novel technologies like ultra-wideband radio, a form of radio frequency identification: RFID. Ultra-wideband uses time delay of arrival and angle of arrival to plot a person's position in a room to within 20cm in 3 dimensions as often as 100 Hz. Ultra-wideband's short timing pulses, less than 1 nanosecond, make possible reliable indoor spatial high resolution for dozens of individuals simultaneously. Temporal measures have served the behavioral scientist very well, resulting, for example, in significant advances in our understanding of human memory. However, our new century is the century of the spatial behavioral measures. From the location based APP in our smart phones to the computers in our automobiles, the measurement of spatial data has become commonplace. For humans, control and use of space has always been of great cognitive significance; we will fight and die to control our territory, but we do not fight and die to control time. How we use space, reveals much about our cognitive state, our recovery status from brain damage, and one's likelihood of falling[1,2]. For example, a person introduced to a novel environment moves about and explores quasi-randomly and builds a 'mental map' of the space in a way that can be captured and quantified using spatial measurement systems, but which would prove very difficult to quantify using only temporal measures gathered from a stopwatch. Once a mental map is formed and the memory of an area consolidated, the pattern of movement and the shape of the paths a person makes moving through that area changes significantly to reflect the consolidation of that knowledge; searching ceases and more direct line travel takes place. However, for persons with brain injury and dementia-related wandering, the mental map may never get consolidated, the exploration process persists, despite the fact that the area should be no longer novel, suggesting the person is lost in what should be a familiar place. **Method** We trace the evolution of precision location tracking technologies from the British Longitude Act of 1714[3], which led to the creation of the first truly portable precision chronometer by John Harrison, to today's indoor person-level tracking, and conclude by presenting several innovative use cases for precision tracking technology in healthcare, such as estimating an elder's fall risk and tracking recovery from traumatic brain injury. Rationales for applying spatial measurement to gerontechnology studies, identifying various indoor and outdoor tracking methods are presented and temporal and spatial measures are compared and contrasted. Advances in scientific knowledge resulting from these new technologies and analytical methods are highlighted. **Results & Discussion** Spatial tracking technologies have heretofore been largely unavailable to researchers in biomedical and behavioral sciences, yet offer new possibilities for expanding understanding of cognitive impairment related to several significant medical conditions affecting older adults.

References

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