Right brain-damaged patients are often affected by spatial neglect, a debilitating cognitive syndrome that affects the ability to respond to and orient to sensory information from the left hemi-space. One of the most frequent manifestation of spatial neglect is the rightward deviation of the perceived straight-ahead, interpreted as a lateralized shift of egocentric spatial coordinates. Moreover, growing evidence have unravelled strong relationships between spatial neglect and misperception of verticality orientation, suggesting that spatial neglect also bear on graviceptive signals. In this line, I will present in this talk a recent study of our Body and Space team that confirms further this frequent association between spatial neglect and verticality misperception. Regarding normal spatial cognition, these clinical observations also raise the eventuality of a common cognitive process involved in a 3-D spatial representation combining the egocentric “straight-ahead” and the gravitocentric “straight-above”. Thus, I will present a new approach aiming to test this hypothesis at the causal level by means of the prism adaptation paradigm and the virtual tilted-room illusion.