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Context effects in perception and discrimination of paired bounce heights

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Experimental work examining the role of context in discrimination and comparison of visual magnitudes is fundamental to developing an understanding of how we judge visual magnitudes. Here we examined the influence of surface properties on perception of bounce height using the method of paired comparisons, where time-order effects (TOEs), which is when an observer over- or underestimates the magnitude of one stimulus relative to another in comparison of two stimuli presented sequentially, were analyzed using Hellström’s Sensation-Weighting (SW) model. We predicted that the surface visual characteristics on which a ball bounces plays a role in comparison of bounce heights, and that a surface with smooth visual characteristics will afford higher bounce height, than a surface with rough visual characteristics, due to an association between the material qualities, smoothness and hardness. Such an association has been demonstrated before and is thought to arise because materials that have smooth surfaces (e.g. plastic, chrome) are typically denser and subsequently harder than those with rough surfaces (e.g., fabric, sand).

Participants (N = 62) observed animations of a ball bouncing on a surface plane with either matte or shiny features. Each trial comprised an animation of two ball bounces in temporal sequence, one with a ball bouncing on a rough plane, and one with a ball bouncing on a smooth plane. The heights of the two bounces in each stimulus pair were varied systematically in semi-factorial combination. The findings include characteristic asymmetries that were found to change systematically in direction and magnitude depending on the surface properties of the plane; bounce height was perceived to be higher for smooth as compared to rough surfaces, for both matte and shiny planes. The relationship between the visual characteristics of the surface plane and bounce height was also studied using a semantic differential scale, where participants rated the surface properties together with various bounce heights in terms of three dimensions: roughness, glossiness, and hardness. In sum, the mean ratings and agreement percentages resemble the weightings revealed by the Hellström’s SW model, where mean ratings for hardness decreased (rated harder) in line with increasing bounce height and smooth surfaces were rated harder than rough surfaces.

The results compliment recent views on material perception – that observers have vivid impressions of what is typical for certain materials based on prior associations and such associations are used when comparing and identifying materials. According to the current study, the visual appearance of a surface on which a ball bounces influences the perception and comparison of bounce heights, where smoothness is perceived as a typicality for hard materials that afford higher bounce heights than softer materials.

References

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