

### The auditory version of the solitaire illusion

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The illusions of numerosity can be generally classified as: illusions in which the wrong appreciation of numerosity is connected to errors related to others dimensions of the percept, and illusion in which the wrong appreciation of numerosity does not accompany any remarkable perceptual distortion. The last category of illusions usually deals with elements arranged in two patterns and the number of the elements of a pattern is overestimated in comparison to that of the other pattern, even if the elements are in direct correspondence one-to-one from a pattern to the other. Some examples are the illusions of Ponzo, Pegrassi, and the solitaire illusion of Frith and Frith [1]. In this work we demonstrated an auditory version of the solitaire illusion due to the arrangement of pitch frequencies of the sounds. Participants were asked to judge if they perceived more drum or piano timbre sounds. When half of the piano tones were perceived as lower than a drum sound and the other half higher, piano tones appeared to be arranged in small clusters, leading to numerosity underestimation. Conversely, when piano tones were perceived to be all higher than the drum sounds, they appeared to be arranged in a larger cluster, leading to numerosity overestimation. Similarly to the visual version of the solitaire illusion, the clustering seems to be determined by Gestalt principles. In our auditory version, a clear reversion of the illusion was observed in the large/small cluster conditions. Our results suggest that at the basis of such illusion must act a mechanism like the *Mächtigkeitseindruck* (impression of power), proposed one century ago by Liebenberg [2]. The impression of power is a physiognomic (tertiary) property of the percept that is immediately caught by the observer, before any attempt to give a determination of the exact number of the elements.

1. Frith CD, Frit U. (1972). The solitaire illusion: An illusion of numerosity. *Perception & Psychophysics*, 11: 409-410.
2. Liebenberg R. (1914). *Über das Schätzen von Mengen*. JA Barth.