Attention Forces Regions to become Figure or Ground by Increasing Their Rationality

The ~~large challenge~~ visual system ~~has to~~ faces a large challenge ~~in~~is to ~~build up an~~ interpreting ~~ation about the~~ stimuli. ~~Even though~~Although human vision generally solves this problem remarkably well~~.~~, ~~there are still~~ in some situations ~~where~~ the visual system ~~could~~ is unable to ~~not reach~~create one conclusive interpretation~~. and will I~~instead, ~~it~~ the brain may interpret the situation in more than one ~~have more than 1~~ equally possible way ~~interpretation~~.

Since the era of the Gestalt psychologists, s~~S~~uch ambiguous perceptual structure phenomena ~~on ambiguous perceptual structure~~ have been ~~investigated~~studied leading to ~~ever since Gestalt Psychologists (#) and~~ one particull~~l~~arly well-known fact: ~~is that~~Attention can be used to voluntarily choose one perceptual structure o~~ver~~ver~~r~~ another. For example, in a typical f~~F~~igure/ground segmentation display (Figure 1.a)~~.~~, the stimuli of alternating red and green regions could be perceived either as red pillars in front of ~~the~~ a green background or as green pillars in front of a ~~the~~ red background. Visual a~~A~~ttention~~ding~~ to red regions will force ~~the red regions~~ them ~~as figure~~to come into view, a~~nd conversely, nd~~ visual attention to green regions will force the green ~~regions as figure~~vice ~~figure to materialize~~versa for green regions.

This finding of ~~"Attention forces regions to become figure"~~ attention leading to perception is usually explained in terms of visual salience: A~~a~~ttention increases the salience of the attended region and a higher salience ~~means~~produces a ~~higher~~larger chance ~~to~~ for recognition ~~become the figure~~ (#). ~~Here,~~In this paper, we take a different approach and use a general ecological principle to account for the function of attention on deciding perceptual structure~~:~~. As we

conjectured in Huang ~~&~~ and Pashler (2007), concentrating focus *~~Attending~~ on ~~to~~ some regions will force the visual system to adapt the perceptual structure, ~~in which the~~ making the attended regions ~~are~~ more meaningful.* (~~hereby~~ The process will be called ~~named~~ "rationality account," i~~o~~n contrast to the "salience account" above). According to this rationality account, when attending to red regions in Figure 1.a~~,~~ the perceptual system will seek a ~~the~~ structure in which the red regions are more meaningful. In the structure of "red pillars in front of green background" the red regions are pillars. On the other hand, in the structure of "green pillars in front of red background" the green pillars are only "~~occluded~~ obscured residuals of green pillars." Pillars are obviously more meaningful than residuals, so attending to the red region will create ~~force the~~ a structure in which the red regions are a figure rather than a background. For our experiment, w~~W~~e randomly generated stimuli similar to the example in Figure 1.a and asked ~~the~~ observers to attend to one specific color and to subjectively evaluate which color appear~~ed~~s to be "in front". Observer~~'~~s~~'~~ ~~preference~~ picked the attended color as "in front" for ~~attended region as figure is~~ 89% of the time, ~~being~~ consistent with the previous findings.

In Figure 1.a, the rationality account and salience account both make the same prediction, therefore ~~so~~ we could not determine~~tell~~ which theory is correct. However, there is a situation in which the~~se accounts~~y ~~will~~ make opposite predictions.

In figure 1.b, red regions and green regions are alternately~~alternatively~~ taken from different meaningful pictures. The salience account, as we understand it, ~~will make~~ predicts outcomes~~ions~~ similar to Figure 1.a: Attending to red regions will ~~still~~ force the red regions to be figures. I~~O~~n contrast, the rationality account predicts opposite outcomes~~will make an opposite prediction. For~~

Comment [MD1]: I'm not sure what this means.

Comment [MD2]: I don't understand how these two accounts differ.

Comment [MD3]: I'm really unclear on the difference between these two accounts

example, The opposite prediction functions similarly to this: Wwhen attending to red regions, for example, because the red regions could may constitute a meaningful landscape scene., As such, tthey will be more meaningfully to be understood as residuals of green pillars (i.e., the observer is viewing the landscape behind green pillars) rather than to be understood as the objects in front (red pillars that coincidentally have images that fit into each other). So the rationality account would therefore predicts that attention will make regions part of the background, not into a figure. In Figure 1.b, Observer's preference s picked the for attended region as figure "in front" only is 33% of the timein Figure 1.b, lower than chance level of 50% (#stat) and also significantly lower than Figure 1.a (#stat), confirming the predictions of rationality account.

> **Comment [MD4]:** What goes here?

If the rationality account is correct, we would then predict that the opposite to usual unusual effect of attention in Figure 2.b critically depends critically on the coherence between different regions. For example, when we look at red regions, if the red regions can notmust make sense together then or there would be no reason to make them background. Figure 2.c provides such an example, in which the regions in Figure 2.b were shuffled and dismis oriented. Thus.So in Figure 2.c, the regions could not constitute any meaningful picture together; therefore,and so we should be backreturn to the normal preference for attended regions as figureforeground figures.