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Con-fusing contours & pieces of glass

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Abstract

We present a new illusory display in which illusory contours are misaligned with physical contours. In these displays, illusory Kanizsa squares, induced by the so-called pacmen, are positioned on top of a background grid of bars. The misalignment of the illusory contours with respect to physical contours of the grid of bars induces an overall 'restless' appearance and evokes the impression that parts of the grid within the illusory square are shifted. To test this impression, we created stimuli in which illusory squares were superimposed on a grid at different positions, where the grid could consist of either straight bars or indented bars. After briefly flashing these stimuli, observers reported indentations of the background grid for those cases in which physical and illusory contours were misaligned. In a control condition, the pacmen were replaced by crosses (not inducing an illusory square) at the same positions; as expected much less illusory shifts were reported in this condition. In a second experiment, we further tested the direction of the perceived shifts, revealing similar trends as in the first experiment and a consistent result with respect to the reported direction of the shifts. We explore and discuss possible underlying mechanisms with regard to our illusory display.

PsycINFO classification: 2323

Keywords: Perceptual organization; Illusory contours; Modal completion; Amodal completion; Misalignment

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1. Introduction

Albert Michotte, to whom this special issue is dedicated, was well aware of the notion that stimulus properties and perceptual properties refer to different matters. The very first sentence in Michotte, Thinès, and Crabbé (1964, p. 5) provides a fine synopsis of that idea:

> "Il est banal de rappeler que lorsqu'on soumet des sujets à l'action d'un système complexe de stimulations, ils mentionnent dans leurs réponses certaines particularités, certains éléments constitutifs des structures perceptives qui contrairement à d'autres, ne répondent à aucune excitation locale, mais dont la présence est déterminée par l'ensemble des stimulations." ("It is a well-known fact that when subjects are exposed to the action of a complex system of stimuli they mention in their responses certain details, certain elements contributing to the perceptual structure, which, unlike others, do not correspond to any local stimulation but whose presence is determined by the stimulus system as a whole"; translation in Thinès, Costall, & Butterworth, 1991, p. 140).

The above statement fits in perfectly with the discoveries of the Gestalt psychologists of the previous century that strongly inspired and guided the work of Michotte. Nowadays, the "filling-in" ability of the visual system to which Michotte refers to, still intrigues many researchers. The present study deals with the basic observation that perceived contours do not necessarily have to be physically present in a stimulus. More specifically, contours are sometimes inferred or completed by the visual system even when there are no actual luminance differences. The so-called Kanizsa square (e.g., Kanizsa, 1955, 1979) is perhaps one of the best known examples of a pattern that induces illusory contours (see Fig. 1). The cut-out sectors of the four disks in Fig. 1 are positioned such that an additional illusory square appears, enclosed by illusory contours between the cut-out sectors. These illusory contours have a vivid phenomenological presence, as if they are evoked by real luminance differences. Note that one may interpret this figure also as a square that partly occludes four complete disks. The interpreted occluded parts of the disks, however, do not have the same phenomenological presence as the illusory contours. Following the phenomenological difference between these two types of completion, Michotte et al. (1964) termed these completions modal and amodal, respectively. Both phenomena have been investigated extensively during the last decades on a variety of issues (see for various examples in this special issue: Bertamini & Hulleman, 2006; Fulvio & Singh, 2006).

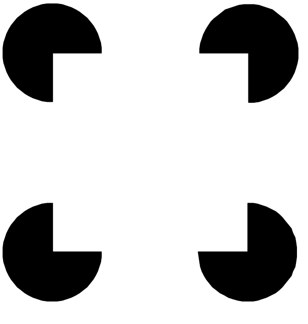

Fig. 1. The Kanizsa square.

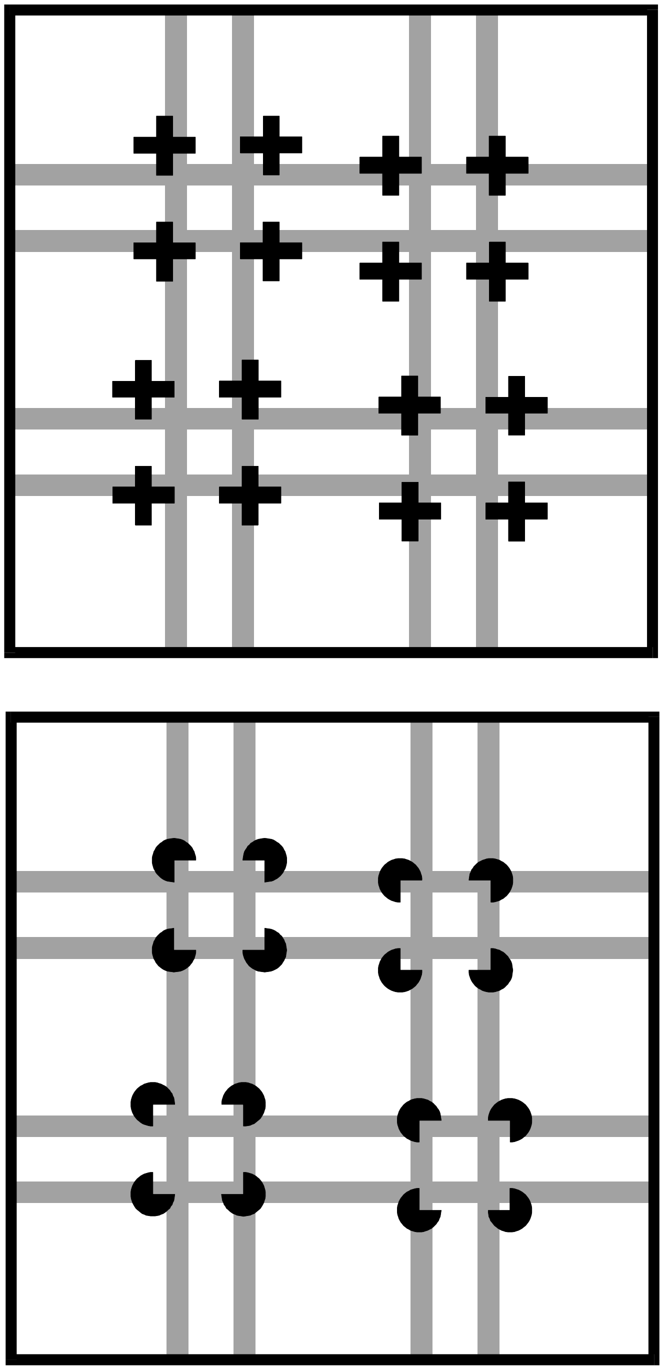

Fig. 2. (A) Pacmen configurations that are misaligned with the underlying grid. The percept is quite 'restless'. (B) Cross configurations that are misaligned with the underlying grid. The 'restlessness' that is apparent in (A) seems to have disappeared.

Here, we introduce a new illusory display (see Fig. 2A), in which perceptual and physical contours and their possible interactions play a role. The display is the result of a relatively simple manipulation in which configurations similar to the one in Fig. 1 have been superimposed on a grid of bars. The crossings of the horizontal and vertical bars have been partly obscured by the superposition of the pacmen configurations (in the following, we will refer to this square area formed by the crossing bars with the term 'grid square'). As a result, the illusory contours induced by the pacmen configurations are misaligned with the physical contours of the underlying grid. The confusing percept of this pattern is striking. The pattern is quite restless; in our initial observations observers mentioned experiencing displacements of the part of the grid bars inside the illusory square – as if it had been clipped and shifted. Observers also reported that they had the impression that the crossings were being watched through pieces of glass.

In Fig. 2B, a display is shown in which the pacmen have been replaced by crosses. The crosses do not elicit an illusory surface (Kanizsa, 1955, 1979) and with that the 'restlessness' seems to have disappeared. In this display there is a more clear segregation between foreground and background (with the crosses superpositioned on the grid). That is, whereas there is an apparent merging of the background and foreground in Fig. 2A, there is no such merging in Fig. 2B.

The illusory percept of Fig. 2A might relate to a phenomenon described by Ramachandran (1986). He showed that when an illusory square is superimposed on a textured background, this texture can be "captured" by the illusory square under specific conditions. This capturing holds that the texture is perceptually pulled forward and is actually seen as being part of the occluding illusory surface. In the studies of Ramachandran, capturing was observed when the display was presented stereoscopically (having disparities between the cut-out sectors), or when the display revealed apparent motion of the illusory surface. Although, in our display, the merging of foreground and background might be related to this capturing phenomenon, a strong sense of ambiguity remains as the area within the illusory surface seems to belong to both the foreground and the background. What is more, capturing alone would not be sufficient to explain the perceived shifts, which might reflect the visual system's attempt to deal with the perceived misalignment by momentarily fusing physical and illusory contours.

Before we speculate further about possible mechanisms that could underlie the observed phenomenon, we first provide experimental support with regard to the confusion that arises from our illusory display. We have set up two experiments in which both pacmen and crosses configurations have been superimposed on an underlying grid of bars similar to that of Fig. 2A and B. With these experiments, we wanted to determine the phenomenologically confusing character of our illusory display by way of independent measurements. More specifically, we hypothesized that if the area within the pacmen configurations appears to be shifted, this would affect judgements on the actual straightness of the grid bars (Experiment 1) or the position of the grid square (Experiment 2) after brief exposure to our illusory display.

2. Experiment 1

2.1. Participants

Twelve participants took part in the experiment and received course credit or a small payment. All were students at the Radboud University Nijmegen and had normal or corrected-to-normal vision.

2.2. Stimuli

The stimuli are shown in Figs. 3A and B. The stimuli consisted of two horizontal and two vertical grey bars in a cross-like configuration together with a quadruplet of either pacmen or crosses superimposed on the grey bars. To test the illusory percept, there were two basic manipulations with regard to the stimuli. First, the underlying bars could be straight or indented. Second, the pacmen configurations or crosses configurations could be centered or non-centered with respect to the grid square. When these configurations were non-centered, they were translated in one of the four diagonal directions (top-right, bottom-right, bottom-left, or top-left). The critical condition is the condition in which the bars are straight and the pacmen are non-centered (similar to the display in Fig. 2A). Based on the initially observed shifts of the area within the illusory surface, we expect that, in this condition, the grid is relatively often erroneously judged to be indented.

The visual angles (approximate values at a viewing distance of 170 cm) of the stimuli on the monitor screen were as follows. Length × width of each bar was $5°43' \times 5'$. The outside width of the grid square (i.e. the square-shaped crossings of the grid bars) spanned $1°5'$ (the inner width was $32'$). The length of the straight edges of the pacmen (i.e., the radius of the disks), and also the length of the inner edges of the crosses spanned $16'$. The distance between the centers of the pacmen within a pacmen configuration spanned $1°5'$; the crosses had a similar position with respect to each other, such that the size of the enclosed square was the same as in the pacmen configuration (i.e., $1°5'$, having the inner edges of the crosses at the same position as the inner edges of the pacmen), non-centered pacmen or crosses configurations were displaced by a diagonal translation of the configurations of $5' \times 5'$ (horizontally vs. vertically) with respect to the grid square. When the bars were indented, the middle parts of both horizontal bars and both vertical bars were replaced in the same direction (vertically vs. horizontally, respectively) by $5'$, revealing a displacement of the grid square (i.e., the crossing section of the bars) in the four diagonal directions as well.

2.3. Procedure

Trials consisted of the following events. First a fixation cross appeared on the screen (1000 ms), followed by a blank display (550 ms). After that, one of the displays appeared on the screen for 300 ms, which was then followed by a mask, shown until the response was given. This 300 ms display duration was chosen as, on the one hand, the presentation time should be long enough for illusory contours to be generated (e.g., Guttman & Kellman, 2004), and, on the other hand, the observation time had to be relatively short to increase the chance of obtaining "first impression" responses. The participants' task was to respond whether the "grey bars were straight or indented (yes/no)". The trials were presented in random order. The experiment was run with Presentation® software on a Pentium IV computer and a 19″ monitor. Each participant received 256 trials; the configurations could be pacmen or crosses (2), they could be centered (with respect to a straight grid) or not (2), and the bars of the grid could be indented or not (2). Each of these conditions was presented 32 times while appropriately balancing the directions of displacement of the non-centered configurations and the possible indentation of the grid bars.

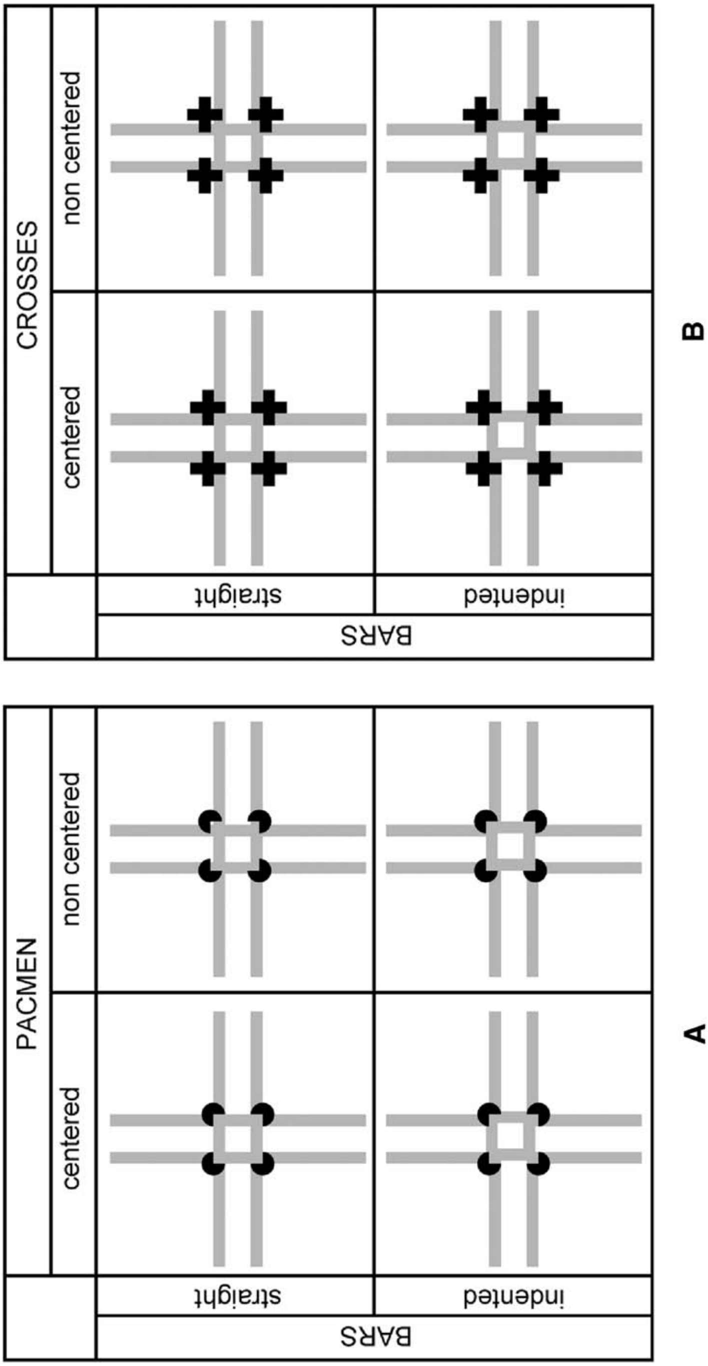

Fig. 3. Examples of experimental stimuli: (A) pacmen configurations and (B) cross configurations.

2.4. Results and discussion

We have plotted the mean proportion of correct judgements for the pacmen configurations and the crosses configurations (see Fig. 4, left display and right display, respectively). Data are plotted for each of the conditions shown in Figs. 3A and B. In the graphs it can be seen that for both the pacmen and the crosses configurations, the proportion correct judgements are lowest for the non-centered configurations. From these mean accuracy values it is clear that performance was worst when the bars were straight and the pacmen configuration were non-centered, which is the critical condition as represented in the initial illusory display (see Fig. 2A). The mean accuracy value of 0.52 for this condition shows that participants were indeed quite unsure about the straightness of the bars (complete guessing yields an expected accuracy value of 0.5). To test this further, a repeated measurements ANOVA was run on configuration (pacmen vs. crosses; 2) × bars (straight vs. indented; 2) × position (centered, non-centered; 2) with accuracy as the dependent variable. The analysis revealed the following effects. A main effect of configuration: $F(1,11) = 13.19$, $p < .005$; a main effect of position: $F(1,11) = 38.60$, $p < .0001$; a significant configuration × bars interaction $F(1,11) = 9.41$, $p < .05$; a significant configuration × position interaction: $F(1,11) = 16.63$, $p < .005$; a significant bars × position interaction $F(1,11) = 33.15$, $p < .0005$, and finally a significant three-way interaction configuration × bars × position $F(1,11) = 18.15$, $p < .005$. The main

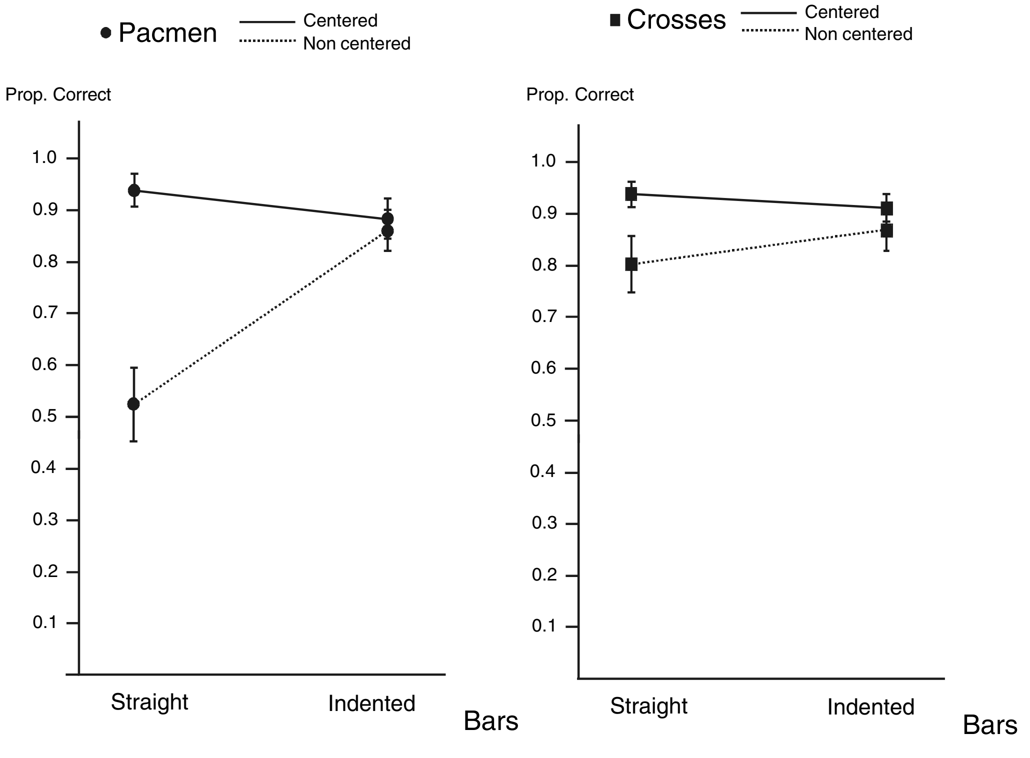

Fig. 4. Results, Experiment 1. Proportion correct responses (bars indented yes/no) for the centered and non-centered pacmen configurations (left panel) and crosses configurations (right panel). The error bars (–/+) represent the standard error of the mean.

effects confirm the observation that the response accuracy is lowest for the pacmen configurations and for the non-centered configurations. The two-way interactions show that effects of bars and position of the configuration are different for both types of configuration, whereas the three-way interaction confirms the different response pattern for both types of configuration. For both the pacmen and the crosses configuration most errors were made in the non-centered/straight-bars condition; a comparison of the correct responses for the pacmen/straight-bars configurations (centered vs. non-centered) reveals a significant difference (t-test, $t_{11} = 6.45$, $p < .0001$) and a similar comparison for the crosses/straight-bars configurations reveals a significant difference as well (t-test, $t_{11} = 3.25$, $p < .01$). Nevertheless, the percept in the pacmen/non-centered/straight-bars configuration condition was much more distorted than the percept in the comparable condition of the crosses configuration; when comparing the proportions of correct judgements for similar conditions between the pacmen configurations and the crosses configurations, this difference was significant (t-test, $t_{11} = 5.11$, $p < .0005$).

All in all, the data show a strong effect of the misalignment between the grid square and the illusory contours on the perceived straightness of the bars for the pacmen configurations. With that, we established the confusing character of our illusory displays, relative to a control display. Note, however, that these measurements merely reflect confusion about the actual physical properties of the displays and not necessarily imply the perception of illusory indentations. What can be said here is that the illusory contours most strongly induce confusion about the straightness of the underlying bars, which indeed confirms the confusing appearance of our display. To get a further grip on the illusory shifts, and the consistency of these shifts, we have performed an additional experiment in which we examined the direction of the perceived shift.

3. Experiment 2

3.1. Participants

Seventeen participants took part in the experiment and received course credit or a small payment. All were students at the Radboud University Nijmegen and had normal or corrected-to-normal vision.

3.2. Stimuli and procedure

Using the same stimuli and timing as in Experiment 1, we now explained to the participants that the grid square could be either perfectly aligned with the rest of the bars (as would of course be the case when the bars were straight) or shifted in one of the four diagonal directions (which would imply indented bars). The participants then had to indicate what the direction of the perceived shift of the grid square was (by pressing one of the five different buttons; no-shift, top-right, bottom-right, bottom-left, top-left, using the numeric keypad).

3.3. Results and discussion

Before zooming in on the critical conditions and the direction of the perceived shifts, we start with an analysis comparable to the analysis of Experiment 1 in which the dependent variable is the accuracy with regard to a dichotomous shift/no-shift distinction (that is, irrespective of the perceived shift direction). Therefore, we have run a repeated measurements ANOVA on configuration (pacmen vs. crosses; 2) × bars (straight vs. indented; 2) × position (centered vs. non-centered; 2) with the above accuracy measure as dependent variable. Note that the bars variable corresponds to the perceived position of the grid square. That is, indented bars imply a shifted grid square, whereas straight bars imply an aligned grid square (the stimuli were the same as in Experiment 1, only the participants' task was different). The analysis revealed the following effects (see Fig. 5 for mean proportions). A main effect of configuration: $F(1,16) = 34.19$, $p < .0001$; a main effect of bars: $F(1,16) = 28.23$, $p < .0001$; a main effect of position: $F(1,16) = 72.61$, $p < .0001$; a significant configuration × position interaction: $F(1,16) = 16.50$, $p < .001$; a significant bars × position interaction: $F(1,16) = 84.92$, $p < .0001$, and finally a significant three-way configuration × bars × position interaction $F(1,16) = 14.42$, $p < .005$. Overall, the results are similar to the ones found in Experiment 1; the most notable difference, however, is that the correct proportions in the non-centered/straight-bars condition are much lower than in Experiment 1 (the proportion of no-shift responses was 0.22 for the pacmen configurations, whereas it was 0.44 for the crosses configuration).

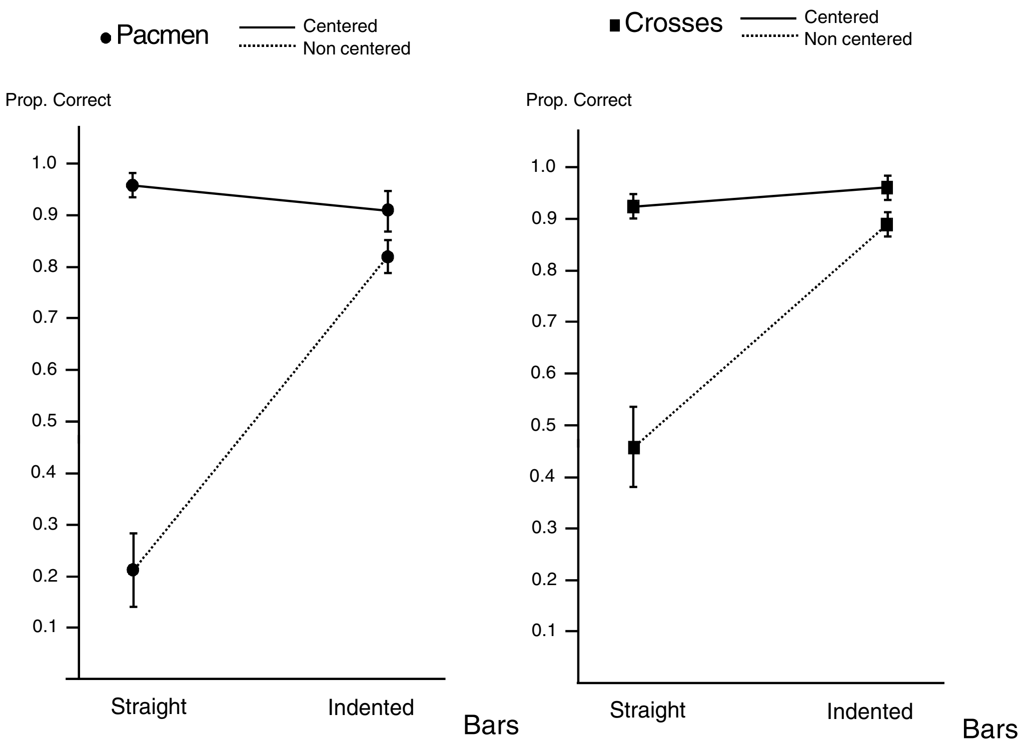

Fig. 5. Results, Experiment 2. Proportion correct responses (shift of grid square yes/no) for the centered and non-centered pacmen configurations (left panel) and cross configurations (right panel). Note: A correct response in this graph implies a correct answer with regard to the question whether a shift of the grid square was present (i.e., irrespective of the direction in case of a perceived shift). Indented bars imply a shift of the grid square. The error bars (−/+) represent the standard error of the mean.

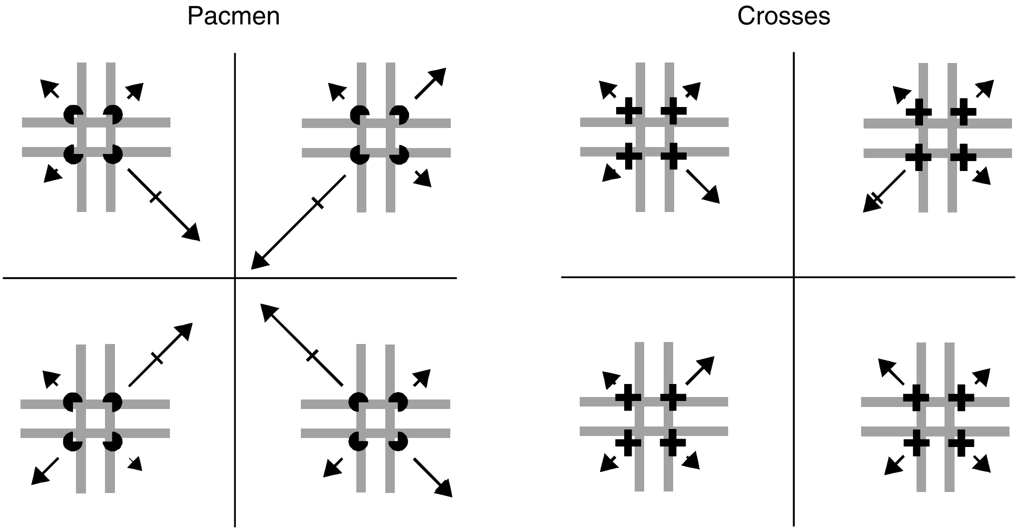

Fig. 6. Results, Experiment 2. The displays show the direction of the perceived shifts of the grid squares for displays with straight bars and non-centered pacmen/crosses configurations (length of arrow corresponds to the proportion perceived shifts in that direction/no-shift, see text). Most notably, these shifts appeared to be mainly *opposite* to the actual shifts of the pacmen configurations.

We now zoom in on these critical (non-centered/straight-bars) conditions. For both the pacmen configuration and the crosses configuration, the proportions on the non-centered position differed significantly from the proportions on the centered position (t-test, $t_{16} = 10.5$, $p < .0001$, and t-test, $t_{16} = 6.68$, $p < .0001$, respectively). Nevertheless, just as in Experiment 1, the percept in the pacmen/non-centered/straight-bars condition appeared to be more distorted than the percept in the comparable condition of the crosses configuration; comparing the proportions of correct judgements for the non-centered/straight-bars conditions between the pacmen configurations and the crosses configurations reveals a significant difference as well (t-test, $t_{16} = 4.43$, $p < .0005$). The overall higher reports of perceived shifts in Experiment 2 might be due to the fact that in this experiment, attention was directed much more locally to the grid square and to the small misalignments between the pacmen, or crosses, and the bars that constitute the grid square and not so much to the global appearance of the bars themselves. Possibly, when judging the position of the grid square, the configuration (pacmen or crosses) is easily taken as a frame of reference and, with that, the misalignment with respect to that configuration is more often taken as real shifts of the grid squares.

The proportions of perceived shift directions have been plotted in Fig. 6 (left panel: pacmen; right panel: crosses); in each quadrant, one of the four non-centered positions is shown. The length of the arrows represents the proportion of perceived shifts of the grid square in that specific direction, relative to a no-shift response for that quadrant. Consider, for example, the left panel (pacmen configurations), top-right quadrant. Here, the longest arrow points in the bottom-left direction, which indicates that most responses with regard to the perceived shift of the grid square were in the direction opposite to the actual displacement of the pacmen configuration with respect to the grid square (on some longer arrows an orthogonal small line is positioned; this line indicates the arrow length if the proportion perceived shift/no-shift would be 1 – e.g., for the pacmen configuration in the upper right quadrant, the mean number of shifts in the opposite direction is about three times the mean number of no-shift responses). The second-longest arrow points in the top-right direction, which is in the same direction as the actual displacement of the pacmen configuration. The directions orthogonal to the displacement of the pacmen configuration result in the smallest arrows. The same trends can be seen for the other quadrants, it can be seen that perceived shifts primarily tend to be in the direction opposite to the displacement of the configuration. Furthermore, for each of the four quadrants, responses indicating a shift in the opposite direction are made significantly more often for the pacmen configurations than for the crosses configurations (*t*-tests on the means per participant reveal the following differences: top-right, $t_{16} = 2.46$, $p < .05$; bottom-right, $t_{16} = 4.00$, $p < .005$; bottom-left, $t_{16} = 2.31$, $p < .05$; top-left, $t_{16} = 3.48$, $p < .005$). Comparing all other directions (i.e., the same direction and the two orthogonal directions) only the same direction in the bottom-right quadrant was significantly larger for the pacmen configurations than for the crosses configurations ($t_{16} = 2.25$, $p < .05$). Although the total number of reported shifts in this experiment was higher than in Experiment 1, the general trends of the responses on the pacmen and crosses configurations agree with that of Experiment 1, having significantly more perceived shifts in the pacmen condition as compared to the crosses condition.

4. General discussion

We have presented an illusory display in which illusory contours were misaligned with the physical contours of a background grid and have further explored our initial observation that parts of the grid occasionally seemed to be shifted. When shortly presenting this display, we found that the proportion of incorrect judgements with regard to the positional properties of parts of the grid were indeed significantly higher when illusory surfaces were superimposed on the grid, as compared to a control display. The actual cause for these false impressions is not clear yet; below we further speculate on a few possible explanations. A first remark, however, that has to be made here is that although the experiments confirm the confusion with regard to the physical properties of the display, no conclusion can be drawn about the specific development in time of the reported shifts. Our initial observation that shifts appear briefly is neither contradicted nor explicitly supported by the experiments; the experiments just (convincingly) show a higher number of wrong judgements after 300 ms presentation of the illusory display. A second remark deals with the reported illusory shifts themselves. That is, the experiments reveal that responses on the displays with illusory contours were most error-prone with regard to the physical properties of the display. As stated before, these responses do not necessarily imply that indentations or shifts were really perceived, although it is reasonable to assume that the reported shifts are at least triggered by the actual percept. On a related note it should be kept in mind that control displays induced a higher number of wrong judgements as well, although significantly less as compared to the illusory display. Apparently, the mere misalignments in the straight-bars/non-centered conditions already induce some basic confusion, independent of the presence of illusory contours. Stated differently, it could be said that the illusory contours might further enhance the basic confusion (especially so with regard to Experiment 2). The reason for this enhancement, however, may very well lie in the particular properties of illusory contours as such. In view of such considerations we simply consider the results of the experiments as support for our general claim that our illusory display is generally more confusing than a control display. That being said we are left with the phenomenological impressions of the illusory display on the one hand and the reported illusory shifts in our experiments on the other hand. Below, we take the latter as additional support to explore a few options with regard to an alleged special role of illusory contours in our displays.

We start with the above mentioned study by Ramachandran (1986) who has shown that when illusory surfaces are superimposed on a textured background, this texture can be captured within the illusory surface. In addition to this capturing phenomenon, the perceived shifts of the captured background might stem from perceptual realignments of the illusory contours with the physical contours (assuming that this would lead to a perceptual shift of part of the included physical surface). Supporting evidence was found for such realignments by Ramachandran, Ruskin, Cobb, Rogers-Ramachandran, and Tyler (1994) who positioned pacmen configurations, inducing square-shaped illusory surfaces, on top of a checkerboard pattern. In these displays an enhancement of the physical contours of the checkerboard pattern was noticed when the illusory contours coincided with the physical contours. Alternatively, when the illusory square was positioned differently, such that it was not aligned with the physical contours of the checkerboard, the illusory contours disappeared. This was due to the various luminance edges orthogonal to the location where illusory contours would otherwise emerge. In addition to this inhibition, the physical contours in the vicinity and in parallel to the inhibited illusory contours appeared to be enhanced. One can speculate that such a relocation of contour activation in combination with the capturing phenomenon is a possible source for the perceived shifts in our displays (revealing a hypothetical displacement of parts of the grid enclosed by the illusory contours in a direction opposite to the translation of the pacmen configuration). It should be noted, however, that in comparison with the checkerboard displays used in Ramachandran et al. (1994), our displays differed in two important ways. Firstly, our displays had (much) less luminance edges that could inhibit the illusory contours. Secondly, the illusory surfaces in our displays were positioned such that they covered a quite arbitrary (irregular) part of the underlying grid. Nevertheless, these kind of contour activations (or relocations of illusory contours to nearby physical contours) could trigger intriguing further research, in which also the actual distance between physical and illusory contours would be an important variable.

A further speculation that we would like to make here deals with the previously mentioned interpretation of the Kanizsa square in which the three-quarter disks are amodally completed behind an illusory surface. This occlusion interpretation implies three different depth layers: the background, the complete disks, and the occluding surface. Note that in this interpretation, the occluding surface 'owns' the parts of the bars that it encloses. Now, suppose that in such a 3-D interpretation, an alignment in 3-D occurs such that *all* illusory contours are perceived to be aligned with the physical contours of the grid. Then a shift in the direction opposite to translation of the non-centered configuration would be the result (for example, to align all illusory contours with the grid square in Fig. 2A/top-right, the upper and lower illusory contour would be shifted upward, while the left and right illusory contours would be shifted leftward). Such an occlusion interpretation, however, will not reveal a very stable percept as the perceptual evidence that the disks are *not* occluded is overwhelming. That is, the parts of bars within the area enclosed by the pacmen are strongly grouped by means of, e.g., collinearity with the parts of the bars outside that area. The restlessness that observers might experience could then be triggered by the ambiguity of the inner part of the pacmen configuration, which could belong to the foreground (as in the occlusion interpretation) or to the background.

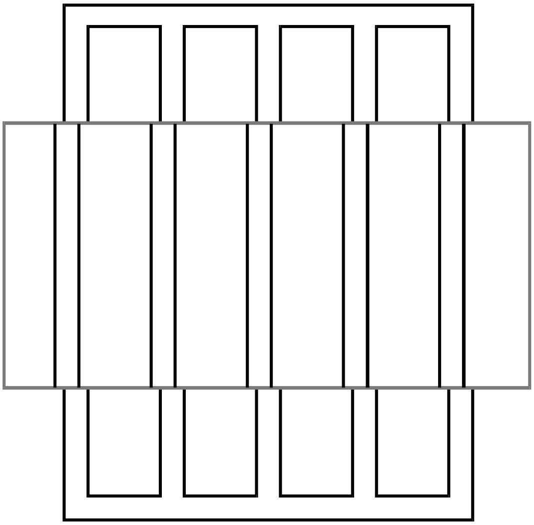

Fig. 7. Bozzi's (1975) transparency phenomenon. This figure is generally perceived as a grating partly viewed through a (rectangular) piece of glass (after Bozzi, 1975).

The previously mentioned glass-piece percept would obviously comply with the latter option. Notice, that a glass-piece interpretation not only allows the complete bars to be interpreted as belonging to the background (as in this case the bars would be seen through a piece of glass), it also complies with the perceived shifts, which might in fact originate from the competing occlusion interpretation. For example, when looking through a small piece of glass at, let us say, an arm length's distance, the part that is "covered" by the glass might be seen somewhat displaced with respect to the background (depending on the type and thickness of the glass, etc.). The reverse is true as well, as was shown by Bozzi (1975); when observers reported their impression of certain stimuli having *physical* displacements such as in Fig. 7, they mentioned seeing the grating through some kind of glass. Notice that the actual displaced image of the bars is experienced in a foreground layer, whereas the bars themselves in fact belong to the background. Glass- or lens-like percepts are also reported by Bertamini and Hulleman (2006) for other kind of displays in which the foreground-background stratification is ambiguous. In our illusory display, the occlusion interpretation and the glass-piece interpretation might continuously rival with each other, each providing a temporary solution to the complexity of the display.[1]

As mentioned, in our experiments we have not explicitly measured the initially observed restlessness as such. The alternation of interpretations as sketched above could provide a handle for future investigations. In addition, attention or eye fixation could influence the illusory appearance as well. For example, paying attention directly to the local physical grid contours might induce a different percept than a spreading of attention in a more global fashion in which certain object properties might be more dominant (e.g., Goldsmith & Yeari, 2003). Within the 300 ms observation time that we had chosen in our experiments,

[1] Marco Bertamini suggested an even stronger link between our illusion and Bozzi's phenomenon: whereas Bozzi's phenomenon (Fig. 7) shows that misalignment signals transparency, our illusion might show the reverse, namely that transparency signals misalignment.

these aspects could also have had their influence. Nevertheless, we can say that we have obtained an overall impression of the confusing appearance (as compared to a control display). When comparisons between the illusory appearances at different intervals are made to track the development of the illusory appearance, it seems however expedient to deal with attention and eye fixation as well.

We have presented a new illusory display with an overall confusing appearance. Our experiments have shown larger proportions of wrong judgements with respect to the location of the physical contours when illusory surfaces are superimposed and slightly misaligned with those physical contours. Decades after Michotte et al. (1964) drew a clear distinction between modal and amodal completion, new relatively simple stimulus manipulations still elicit perceptual effects of which the exact underlying mechanisms have yet to be unravelled. The (con-)fusion that arises within and from the percept is in our view a merit of its own and acts as a trigger toward further investigations.

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