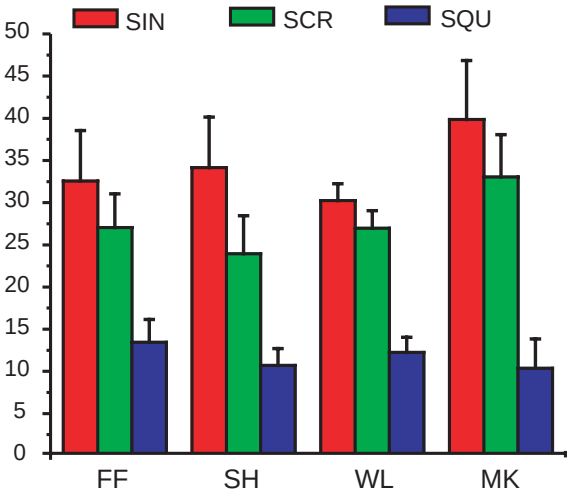
ency
general
stem. Re
al channe
ling mechan
portant comp
nd motion and f
. It is possible tha
eration of MAE, wh
edicting MAE of a co
omponents. Actually, sc
effects of cross-channel
(Levinson & Sekuler, 197
1980).
er MAE can be predicted base
easured the strength of MAE t
ial patterns. In particular, in Exp
her changing the relative phases c
in a pattern will alter the perce
we did find a contribution from spat
t 1, we further tested whether the pa
urs during the adaptation or testing
ent 2. Nishida and Johnston (1999) sh
aftereffect could alter the perceived po
target. In Experiment 3, we also test if spa
nfluence the perception of illusory positio
ng motion adaptation.

Experiment 1: Does spatial matter in MAE?

The purpose of this experiment is to compare
magnitudes generated by sine wave and square
ings. We also measured the MAE from a compl
that shares the same amplitude spectrum with t
wave grating, but with scrambled phases. Because
izing the phases of sine wave components could
peak contrast of a complex grating higher than
wave, and some studies (Keck, Palella, & Pantle,
shida, Ashida, & Sato, 1997) have shown that i
adaptation contrast increases the peas


SIN
SCR
SQU
50
45
40
35
30
25
20
15
10
5
0
FF
SH
WL
MK

Control experiment

A possible explanation for weak MAE from SQU as test pattern is that subjects used different criteria for judging when the different patterns are (and are not) in motion. For example, if it were in some sense “harder to see” a particular pattern movingbeid 10.98j422a

Results

As shown in Figure 5, spatial pattern played an important role in the MAE-induced position change. For the sine wave grating, all three subjects needed a significantly larger (about 3 times larger) spatial shift between the two gratings to perceive them as aligned, compared with the square wave grating (< .01). A potential explanation of this phenomenon is that the square wave grating provides a strong position cue to prevent the illusory position shift.

Discussion

We found that the square wave grating produced much weaker MAE than the sine wave and complex gratings. Cross adaptation between these patterns showed that the square wave grating was not a weaker adaptor for the motion system. The weak MAE was only observed when square wave grating was used as the test stimulus.

Why does square wave grating as a test pattern generate very weak MAE? We suggest that two properties of the square wave pattern may contribute to this result: position reliability and local luminance uniformity. Intuitively, if a test stimulus provides reliable cues on spatial position, then it will be difficult to generate illusory motion. The square wave grating, with the black and white boundaries sharply localized, presumably provides such reliable position cues. Similarly, the reliable positions cues can prevent the illusory position shift of the test pattern. This point was supported by a parallel study (Fu, Shen, & Dan, 2001). In their experiment, motion-induced perceptual extrapolation of both first- and second-order targets depended critically on spatial blurring of the targets. For example, the perceptual displacement of a sharp-edged target was near zero; however, for a target with Gaussian profile, its displacement was very significant. The influence of visual motion on perceived position has been well acknowledged (see a review by Whitney, 2002). The current study highlights the reverse influence, that the reliability of position cues strongly affects the strength of perceived illusory motion. It supports the intricate relationship between representations of an object's (or pattern's) location and its motion, possibly supported by the interactions between MT and V1 neurons (Ramachandran & Anstis, 1990; De Valois & De Valois, 1991; Whitney & Cavangh, 2000; Pascual-Leone & Walsh, 2001; Murray, Kersten, Olshausen, Schrater, & Woods, 2002). With this explanation, it is not surprising to find that the MAE from a square wave grating as a test pattern is not accompanied by a concurrent shift in the apparent position.

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Corresponding author: Fang Fang.
Email: fang0057@umn.edu.
Address: 75 East River Road, Minneapolis, MN 55455, USA.

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