30 Expertise in Drawing

Aaron Kozbelt

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(like faces in portraiture), in specialized knowledge of artistic styles they might deploy (like realism or Impressionism), in the use of particular media of artistic expression (like charcoal or oil paint), or in the actual experience of producing art? To what extent do specifically aesthetic or creative modes of cognition (e.g. Cupchik, 1992; Martindale, 1990), which may differ substantially from both everyday perception *and* a mode of perception emphasizing visual realism, contribute to artists' expertise? In terms of visual processing advantages, is the expertise of artists better characterized as domain-specific (i.e. tied to particular categories of familiar stimuli) or domain-general (i.e. applying to visual processing in more general, flexible ways)?

Despite a recent surge in research on artists and perception, many of these questions defy simple answers. Constrained by the nature of extant research, here we stake out the following positions vis-à-vis these questions. First, we focus on the necessity of having experience in making art for perceptual advantages to accrue, particularly since most researchers have tested visual artists, rather than art critics or historians (thus providing little guidance on possible perceptual advantages among members of these latter groups). Moreover, while knowledge of the effects of particular artistic media likely constitutes an important aspect of real-world artistic expertise (Kozbelt & Seeley, 2007), most laboratory drawing tasks involve just pencil and paper, minimizing the relevance of media-specific knowledge in empirical studies. Second, we focus exclusively on drawing tasks involving accurate, visually realistic depictions, where creativity is often explicitly discouraged; thus, the extent to which visual accuracy itself may be indirectly guided by specifically aesthetic or

Bottom-Up Explanations

Bottom-up explanations of drawing skill ultimately derive from the in uential and long-standing idea of the "innocent eye proposed by art historians John Ruskin (1971) and Roger Fry (1960). Couched in modern terms, this notion

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methods may be best for resolving an object's two-dimensional proportions or clarifying details, while top-down methods may facilitate appropriate visual selection. Delineating the meaning of *kno ledge* (and its interfering versus facilitating effects) on the two accounts is also clarifying; the bottom-up view engages generic knowledge of object types useful for everyday perception, while the top-down view regards knowledge as highly specialized, artificial, and domain- (or even medium-) specific, and useful for understanding object structure and means of achieving desired effects in depiction.

A more integrated understanding might also be had by conceptualizing bottom-up and top-down modes of perception as *strategies*, exibly implemented to deal with perceptual ambiguities, rather than mechanistic perceptual processes without substantive consideration of context (see Ullman, 1984, for such an overtly strategic account of object perception involving temporally extended visual "routines). A more bottom-up strategy might involve selecting the most characteristic lines, angles, or shapes upon which to construct forms, and assessing overall spatial relationships, for instance, in "apprehending the relation of forms and color to one another, as they cohere within the object

(Cohen & Bennett, 1997; Ostrofsky et al., 2012). For instance, in one recent investigation (Kozbelt, Snodgrass, & Ostrofsky, 2014), artists and non-artists created depictions by placing 225 small squares of black tape within a 28 × 32 grid superimposed on a photograph of a face. Superimposing a standardized grid on the reference image, where each square may be either black or white, allows for objective binary coding of each "pixel within the depiction. Moreover, the reference image can be processed via image manipulation software to preserve the position, coarseness, and size of the grid, and the number of black versus white elements; this can then serve as the "best pixelated drawing, at least in bottom-up terms. An analysis comparing square placement in each drawing with that of a computer-generated version of the image revealed a large artist advantage in sensitivity to placing the squares appropriately – a bottom-up index of drawing skill. Subjective accuracy ratings by artist and non-artist judges also indicated that artists' ratings of other artists' renderings were considerably higher than any of the other three drawer–rater combinations (consistent with Kozbelt et al., 2010). This method provides a means for further integrating bottom-up and top-down explanations of drawing skill that transcends defining bottom-up advantages mainly in terms of overcoming perceptual constancies, by extending it to include other aspects of the bottom-up signal, like relative luminance across an image. It also allows an assessment of how participants process the bottom-up signal (in terms of matching the distribution of correct answer squares) compared to a top-down, caricatured deviation from that signal – in terms of systematic deviations from the "best bottom-up depiction, in the service of greater expressiveness (see Figure 30.4).

Future Directions

Methodological Issues

We have identified instancmn4Tc(-1.7(s)216[wh189(er214.3(e)-21057Tr

advantages in visual perception, attention, knowledge, and decision-making. However, significant methodological questions linger in this body of research. For instance, virtually all the studies described above have adopted correlational or quasi-experimental methods, leaving the direction of causality ambiguous. Take findings like smaller size constancy effects among experienced artists compared to inexperienced non-artists (Ostrofsky et al., 2012) or an observed positive correlation between errors produced among non-artists in drawing versus perceiving angles (Ostrofsky et al., 2015). Such results could indicate that perceptual processing advantages precede and thus causally engender drawing advantages, or that developing drawing skill causes individuals to perceive more accurately or efficiently, or that they co-evolve or co-vadhition

(e.g. Kozbelt et al., 2010; Perdreau & Cavanagh, 2014). Following the logic of Gombrich (1960), such an advantage can be attributed to artists routinely needing to solve the same kinds of problems in making depictions as the visual system does generally for understanding the world. The dynamic described throughout this chapter is consistent with Ericsson and Lehman's (1996) characterization of skill acquisition involving the adaptation of pre-existing mechanisms (in this case basic perceptual processes) to particular task constraints (making visually accurate two-dimensional artistic depictions based on observation of the three-dimensional world).

Characterizing in detail how artists engage particular perceptual and attentional mechanisms and translate them into superior drawing performance remains a challenge. For instance, how deeply into the visual system do perceptual differences between artists and non-artists run? To date, research on relatively low levels of perceptual processing – such as psychophysical indices of perceptual organization thresholds among artists and non-artists on several Gestalt grouping principles (Ostrofsky, Kozbelt, & Kurylo, 2013) – has yielded null findings. Along similar lines, Perdreau and Cavanagh (2011) framed their investigation as "Do artists see their retinas? and argued for an answer in the negative. Furthermore, Cohen and Bennett (1997) provocatively hypothesized a distinction between *illusions*, which are rooted in low-level, cognitively impenetrable mechanisms, and *delusions* due to the interfering effect of knowledge, which they argued are responsible for most drawing errors but which can in principle be overcome.

Finding meaningful artistic expertise-based psychophysical differences at very low levels of

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