SUPPLEMENT TO

CHAPTER 4, V1[1]:

COROLLARY NETWORK PRINCIPLES

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PRINCIPLE 5: PRIMING

The following material extends the discussion by Tryon (2014, p. 232) of Principle 5: Priming. The following material was taken from the special section on behavioral priming and its replication that appeared in the January 2014 issue of *Perspectives on Psychological Science*, Volume 9, Issue 1.

Cesario (2014) argued that we have *a priori* reasons to expect that priming effects are highly sensitive to methodological variations and therefore that failures of exact methodological replications should raise little concern. Cesario noted that contemporary theory construction remains inadequate to specify what these conditional variations are.

Klatzky and Creswell (2014) proposed an interactive intersensory "bidding" theory that they claim "identifies systematic factors that might undermine priming, including random variation in estimates, contextual influences on memory retrieval and inference, competition among information sources and cognitive control. These factors are not only explanatory but are predictive of when priming effects can be expected" (p. 49). They describe their model as follows: "A general model for intersensory integration suggests that each of multiple input sources produces an estimate or *bid*, for the value of some physical property of the world, and these bids are weighted and integrated" (p. 50). This is a description of the stimulus microfeatures of the generic connectionist model presented by Tryon (2014, p. 132) as Figure 3.1 in Chapter 3. "Each independent input channel takes in some data from a stimulus event, from which it produces an

[1] V1 stands for Version 1 which implies that subsequent chapter updates will become available.

estimate of the event's magnitude along some quantifiable dimension" (p. 50). This statement reflects the weights that connect the S and O layers of Figure 3.1 in Tryon (2014). The bids referred to above are an alternative term for the connection weights that represent activation levels between processing nodes. Klatzky and Creswell (2014) assert that "A weight is assigned to each of the channels, and an integration process produces a weighted combination (often assumed to be a sum) as the result. This output constitutes the integrated estimate of magnitude alone the underlying perceptual dimension" (p. 50). This comment reflects the simulated dendritic summation and associated transfer function discussed by Tryon (2014, p. 134) and illustrated in his Figure 3.3. Hence, it appears that Klatzky and Creswell (2014) have independently constructed a connectionist model that has been around since 1986. Their lack of citation of connectionist models implies a lack of awareness of connectionist modeling. The main consideration here is that their work indicates that better connectionist models of priming can be developed.

Klatzky and Creswell (2014) extend their bidding model to memory which in connectionist models entails reactivation of connection weights to what they were at the time the relevant memories were formed. See Tryon's (2014) discussion of Principle 4: Reactivation.

Figure 1 in Klatzky and Creswell (2014) diagrams an explanation for how their proposed intersensory integration occurs. This is a functional description at best because no proximal causal mechanism information is provided. On the contrary, the explanation of priming provided by Tryon (2014) specifies a causal sequence. All processing pathways taken through the network are biologically reinforced on the basis that neurons that fire together wire together. This experience-dependent plasticity property makes it more likely that this processing route will be taken on subsequent occasions.

That priming is such a natural, hard, and risky prediction of the basic generic connectionist model means that it is to be expected. The strength and certainty of this theoretical prediction lends credence to those who have reported priming effects and calls into question the reports of investigators who have not found priming effects. There are many more ways to not find an effect than there are to find an effect. Moreover, no theoretical reason has been provided for why priming effect should not occur. Here we can see the powerful role that theory plays in interpreting empirical findings. Dijksterhuis (2014) endorsed the important role that theory plays in science.

PRINCIPLE 12: TOP-DOWN PROCESSING

The material presented in this section extends the discussion by Tryon (2014, p. 249) regarding of Principle 12: Top-Down and Bottom-Up processing.

Tryon (2014, p. 338) discussed image generation (Farah, 2000), better known as imagination, and how it activates many of the same neural networks used for vision (Kosslyn & Thompson, 2000). Imagination entails top-down processing whereas vision mainly entails bottom-up processing. Here I report a study by Laeng and Sulutvedt (2014) demonstrating that **imaginary light** activates the same neural networks that control pupil size as does real light. The authors cited (without source identification) that 130 years ago Sir Francis Galton (1883/1907) asked "Is the brightness of a mental image comparable to that of the actual scene?" They noted that pupil size reacts unconsciously and uncontrollably to brightness of light therefore removing the possibility of faking a response. The authors measured pupil diameter under perception and active imagery conditions regarding dark and bright images. They reported that pupil diameter was less during imagery than perception under both dark and bright images. But more importantly, they reported that pupil diameter was less when imaging bright images than when imaging dark images. That is, pupils constructed when participants imagined the bright image and dilated when they imagined the dark image just as is the case when viewing the bright and dark images. This is hard evidence that imagination activates at least some the same neural networks that control pupil diameter but to a lesser degree than real perception does.

On the negative side, Firestone and Scholl (2014) questioned the validity of five specific studies, that they claim are representative of dozens more, regarding a variety of top-down influences on perception such as whether wearing a backpack makes hills look steeper (Bhalla & Proffitt (1999), learning color-letter associations makes letters appear to be tinged with color (Goldstone, 1995), and that reflecting on negative words or actions actually makes the world appear darker (Banerjee, Chatterjee, & Sinha, 2012; Meier, Robinson, Crawford, & Ahlvers, 2007). They used the El Greco fallacy to question these findings. They found top-down perceptual effects under conditions where they should not occur.

Psychological Placebo

The term psychological placebo may seem redundant in that placebos are understood to only work for psychological reasons. I use the term psychological placebo to refer to placebos that have been designed to maximize their biological impact. The main reason one would want to develop a psychological placebo is so that it can be certified as a drug, medicine, and dispensed through pharmacies nationwide. Tryon (2014, p. 558) describes how this can be done.

Psychological placebos begin with a harmless but possibly beneficial substance such as an herb. Another harmless but clearly noticeable substance is added in order to produce what are typically called "side effects". These effects are critical in that they prove to the patient that their "active drug" is working. Then one needs a putative mechanism for how this new compound can alter the brain in a way that might produce relief for a common condition such as anxiety or depression. I said putative because one need not actually prove anything here by way of causal mechanism. The FDA permits as many trials to be conducted as required to achieve statistical significance. This includes selective patient recruiting and cherry picking results. Once FDA approval is obtained then this new medication can be ethically prescribed by physicians everywhere. It can also be prescribed "off label" for a wide range of disorders other than the one used to gain approval. There need be no concern that subsequent research is not support, or may even falsify, the putative causal mechanism because once the FDA classifies a substance as a medication, it will never be reclassified as a placebo.

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