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EFFECT OF MENSTRUATION ON SPEED, STRENGTH AND SELECTED PHYSIOLOGICAL VARIABLES

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Effect of Menstruation on Speed, Strength and Selected Physiological Variables

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Abstract – The speed and the accuracy of a perceptual judgment depend on the strength of the sensory stimulation. When stimulus strength is high, accuracy is high and response time is fast; when stimulus strength is low, accuracy is low and response time is slow. Although the psychometric function is well established as a tool for analyzing the relationship between accuracy and stimulus strength, the corresponding chronometric function for the relationship between response time and stimulus strength has not received as much consideration.

Keywords: Speed, Strength, Response, Psychometric, Periodization

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INTRODUCTION

Response time and accuracy depend on the difficulty of a perceptual judgment. Increasing the stimulus strength or difference between stimuli decreases response time and increases accuracy. Measurements of accuracy as a function of the stimulus strength are known as psychometric functions and are central to the study of psychophysics (e.g., Klein, 2001). Measurements of response time as a function of stimulus strength are sometimes known as chronometric functions (e.g., Link, 1992). The goal of this study is to understand how these measurements are related to one another. We measure both functions and test the predictions of a low parameter version of the diffusion model (e.g., Ratcliff, 1978; Ratcliff & Smith, 2004). This theory predicts a close coupling between the effect of stimulus strength on response time and its effect on accuracy.

THEORIES OF ACCURACY

A theory of how stimulus strength affects response time and accuracy requires assumptions about the encoding of the stimulus and how this internal representation is used in decision making. In short, it needs assumptions about scaling and decision. To set the stage, consider theories of scaling and decision intended for accuracy experiments. The modern starting point is signal detection theory (Green & Swets, 1966; Macmillan & Creelman, 2005). In this theory, the stimulus is represented by a random variable and the decision is made by comparing a sample from this random variable to a criterion. The theory allows one to distinguish between sensitivity manipulations that affect the stimulus representation and bias manipulations that affect the decision criterion. Sensitivity is summarized by the d′ measure, which is the difference between noisy representations normalized by their standard deviations.

PSYCHOMETRIC FUNCTIONS

To relate a particular stimulus to sensitivity, one must assume something about the scaling of the stimulus into the internal representation. Assuming a simple proportional scale, d′is linear with stimulus strength and the shape of the psychometric function follows from the distribution of the noisy representation (Tanner & Swets, 1954).The common assumption of Gaussian noise results in a psychometric function that is a cumulative Gaussian. This proportional scaling can be generalized by allowing d′ to be a power function of stimulus strength (Nachmias & Kocher,1970; Pelli, 1987). For example, contrast discrimination of simple disks can be described by a proportional scale, whereas contrast detection requires a power function scale (Laming, 1986; Leshowitz, Taub, & Raab, 1968). In short, the form of the psychometric function depends on assumptions about both the scaling and decision.

THEORIES OF RESPONSE TIME

The starting point for modern theories of response time is sequential sampling theory (Stone 1960; Wald, 1947; for a review, see Luce, 1986). The internal representation of the relevant stimulus is assumed to be noisy and to vary over time. Each decision is based on repeated sampling of this representation and comparing some function of these samples to a criterion. For example, suppose samples of the noisy signal are taken at discrete times and are added together to represent the evidence accumulated over time. This accumulated evidence is compared to an upper and lower bound. Upon reaching one of these bounds, the appropriate response is initiated.

CHRONOMETRIC FUNCTIONS

Perhaps the most comprehensive analysis of chronometric functions was provided by Link (1992; Link &Heath, 1975; Smith, 1994). Link and colleagues focused on a very general version of sequential sampling theory called relative judgment theory coupled with a very general scaling assumption. This theory predicts a constraint on the relation between response time and accuracy (the "RT versus Z" relation). Such a constraint is also the center of the more specific models that are pursued in this article. An alternative approach was taken by Ratcliff and colleagues, who investigated diffusion model with parameter variability (e.g., Ratcliff, 1978; Ratcliff & Rouder, 1998). These studies focused on using this generalization of the diffusion model to account for differences between correct and error response times in a wide range of perceptual and memory tasks. Most relevant here, a few of their studies restricted how the parameters of the model depend on stimulus strength in perceptual discrimination. For example, Smith, Ratcliff, and Wolfgang (2004) used a three parameter Naka-Rushton function to describe the internal response to contrast. While there are only a few theoretical studies of the effect of stimulus strength on response time, there are many empirical measurements. An early example of a chronometric function was described by Kellogg (1931). Many of the early measurements were performed under conditions with few errors (e.g., less than 5%).Under such conditions, with few errors (e.g., less than 5%). Under such conditions, response time is well described by a power function of stimulus strength with an additive constant

PER IODIZED PREPARATION FOR THE STRENGTH ATHLETE

The use of per iodized training has been reported to go back as far as the ancient Olympic games. Its basic premise is that through manipulating training volume and intensity, in conjunction with appropriately timed short unloading phases, the athlete can reach peak condition at the appropriate time, and minimize the risk for overtraining. This article will address the background of periodization, its efficacy and various models of per iodized training, with the primary emphasis on the strength/power athlete.

The basic principle of periodization is a shift from an emphasis of high volume (exercises x sets x repetitions) and low intensity (% of maximum effort) training to low volume and high intensity training. The training year is divided into distinct phases known as mesocycles. Each mesocycle relates to a change in the volume and intensity of training, and may last for 2 – 3 months depending upon the athlete. Typically each mesocycle reflects a specific training emphasis for that phase of training. The initial mesocycle is called the preparatory or hypertrophy phase and consists of high volume and low intensity training. It is designed to primarily increase muscle mass and muscle endurance, and to prepare the athlete for more advanced training during the later stages of training. The next two mesocycles are generally referred to as the strength and strength/power phases, respectively. In these mesocycles training intensity increases while training volume is reduced. The final mesocycle of the training year is the peaking phase. During this training phase the athlete prepares for a single contest by further reducing training volume and increasing intensity.

EFFECTIVENESS OF PERIODIZATION

Increases in strength have been shown in both periodized and nonperiodized resistance training programs. However, strength improvements do appear to be greater as a result of periodizedtraining3. The upper range for strength improvement in the 1RM bench press is reported to be about 17% in nonperiodized training programs and 29% in periodized training programs, while the upper range for 1RM squat is 32% in nonperiodized and 48% in periodized training. In addition, periodized resistance training programs appear to be superior than nonperiodized training programs in generating improvements in vertical jump performance. These studies provide evidence that periodized resistance training is more effective than nonperiodized training in eliciting strength and motor performance improvements. However, this advantage may be largely dependent upon the training status of the individual. The magnitude and rate of strength increases are much greater in untrained individuals than in trained individuals, therefore in consideration of the rapid strength increases seen in novice lifters, periodized training may not be necessary until a certain strength base has been established.

CONCLUSION:

The objective of periodization is to make the most of the possible of the athlete to reach peak condition by manipulating both training volume and training intensity. The speed and the accuracy of a perceptual decision depend on the potency of the sensory inspiration. When incentive strength is high, accuracy is high and response time is quick; when stimulus strength is low, accuracy is low and response time is low. Although the psychometric function is well established as a tool for analyzing the relationship between accuracy and stimulus strength,

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