Chapter 9
Mathematical Models of Desire, Need, Attention, and Will Effort

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ABSTRACT

According to Spinoza, "Love is nothing else but pleasure accompanied by the idea of an external cause". Author proposes that desire is nothing else but a change of pleasure accompanied by the idea of its cause, that terms 'desire', 'want' and their cognates describe change of the pleasantness of the state of a subject (PSS in short) associated with X, that if change of PSS is positive/negative, then X is called desirable/undesirable correspondingly. Both positive and negative desires can be strong, so strength of desire characterizes its magnitude. Need of X is defined here as a cyclical desire of X that gets stronger/weaker with dissatisfaction/satisfaction of its need. Author also explores an idea that the stronger is desire of X by a subject, the more attention this subject pays to X. Distribution of attention and influence on it by the will effort are analyzed in this paper.

INTRODUCTION

The main objective of this chapter is to present new, closely linked mathematical models of desire, need, and attention. According to Spinoza (1674/1955), "*Love* is nothing else but *pleasure accompanied by the idea of an external cause: Hate* is nothing else but *pain accompanied by the idea of an external cause*" (p. 140). The author posits that desire is nothing else, but a *change* of pleasure accompanied by the idea of its cause. These definitions are so close, because loving/liking and desiring are two facets of the same process that author calls "Hedonic Recognition"[1] – the terms 'desire', 'want' and their cognates are used to describe *change* of the pleasantness of the state of a subject[2] associated with X, while the terms 'love'/'like' and their cognates are used to describe the hedonic *end result of this change.* If X causes a positive/negative change, then X is called "desirable"/"undesirable" correspondingly.

Some support for this view on desire can be found in the classical literature, for example, in the writings of Aristotle and Locke; it also has some experimental backing (Ovsich & Cabanac, 2012). The author finds verification of this idea in the analysis of the process of needs satisfaction that has a typical pattern: dissatisfaction of a need for X creates desire for X by *lowering* current pleasantness of the state of a subject (pangs of hunger, pain of the withdrawal from a drug, etc.) while, at the same time, usually *raising* pleasantness of perceiving or even imagining X. These two simultaneous processes make X to be a factor of maximization of pleasantness, make X desirable. In other words, this creates the positive hedonic gap between the pleasantness of a state of a subject *with* and *without* X and this gap is called "desire for X". The magnitude of the hedonic gap of desire is the measure of X's desirability or desire strength; it increases with growth of dissatisfaction of the need for X, that in the terminology of this theory means that *desire for X gets stronger.* The exact opposite happens with the satisfaction of a need.

Desires attract attention of a subject to their objects. For example, objects of a dissatisfied need come to the attention of a subject more and more persistently with the growth of this need's dissatisfaction. If a need is grossly dissatisfied, then objects and activities of satisfaction of this need can dominate the center of attention of a subject, consume attention. In the first approximation, the stronger the desire is for X, the more attention X gets and this proportionality is explored in this chapter. Voluntary attention is driven by the will effort that can suppress or support competing desires. This mechanism is addressed here in the framework consistent with William James's (1927) approach.

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