The Signal Detection Theory (SDT) in ophthalmology
La Teoría de Detección de Señales en oftalmología

The Signal Detection Theory (SDT) is an analysis system for decision-making developed in the fifties and sixties which had a considerable repercussion in Medicine and a highly promising future in Ophthalmology. It involves a noise-surrounded signal which is transmitted to a person or machine and the decision (response) it brings about therein. This apparently simple system proved to be very useful in unrelated activities such as surveillance/alarm and medical diagnostic. Schematically, it works like a binary Yes-No response system vis-à-vis the signal/noise, giving rise to a 2x2 matrix: true hits, false positives, true omissions and false negatives (two errors and two correct decisions). The best known graphical expression of this system is the ROC (Receiver Operating Characteristic) curve, the shape and surface of which indicates with precision the sensitivity and specificity (discriminative ability or perceptiveness) of any person or machine. The prerogatives and principles of SDT were well established, mathematically and psychologically (1,2). Subsequently, computer programs were developed, and these performed very well in the assessment of machines and diagnostic techniques, provided that an adequate threshold or criterion was established beforehand (3). In Ophthalmology SDT began to be used in perimetric diagnostic of glaucoma (4), assessing with ROC curves the perimeters of different marks with new strategies (fast or slow) on normal population, with high ocular pressure and confirmed glaucoma, as well as in other related assessments such as the structural parameters of the papilla. In our country, the group of González de la Rosa (5) has compared its own strategies with the gold standard (total thresholds, bracketing) by means of SDT, studying different «cross-section» and parameters (SM, DM, LV). At present, SDT is a requirement for research.

However, the original psychological and physical aspect of SDT was flatly discarded by the Central European perimetric establishment due to the technological uncertainties of the time (6). SDT proposes a different psycho-physical interpretation of the admitted Fechnerian value and utilizes concepts such as noise, signal, signal+noise or criterion. It assumes that the stimuli must be detected against a noisy background and that the individual has his own response criteria (7). The sensitivity of SDT would depend: a) on the intensity of the signal, b) on the local sensitivity of the observer, influenced by the noise and his concentration, and c) on the criterion adopted by the observed, determined by his motivations and expectations. The bias of the human factor of awareness of SDT (typically attributed to naivety or fatigue) could explain the persistent short- and long term variability observed in perimetric series regardless of the modern filtering operations. Hypothetically, equipped with engineering and algorithms, the mathematical structure should allow for an aggregate numeric calculation of sensitivity (d’) and criterion (β) in one and successive explorations, and for raising ROC curves. The criterion would constitute an interesting corrective factor for achieving perfect perimetry.

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REFERENCES