



Easy-to-hard effect: An application against electronic fraud

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Phishing is an electronic fraud aimed at acquiring sensitive information from Internet users by posing as a trustworthy company. Scammers typically use e-mails with links to fake sites that accurately mimic real ones. However, these spoofed sites are not always a perfect copy of the legitimate version, and they usually present visual discrepancies related to page layout, picture quality or typography. With the appropriate perceptual training, these subtle discrepancies may become noticeable but, which training regime should be appropriate?

When the critical distinction between stimuli is very subtle, an effective choice is to overstress the difference at the beginning of training, and progressively reduce this emphasis until target discrimination is reached (e.g., Lawrence, 1952; Moreno-Fernández, Ramos-Álvarez, Paredes-Olay, & Rosas, 2012; but see Arriola, Alonso, & Rodríguez, 2015). This schedule usually facilitates learning of the difficult discrimination (easy-to-hard effect). Can easy-to-hard effect be used to teach people how to detect fake websites?

Goal & Hypothesis

One experiment was conducted with the main goal of testing the easy-to-hard effect in website categorization.

Participants with progressive training (easy-to-hard) are expected to be more accurate in identifying a fake website than those trained with a regime without changes in difficulty (hard-to-hard).

Participants & Stimuli

Forty-two undergraduate students of the University of Deusto (18-30 years old) volunteered for this experiment as an optional course activity. A bank website was created, and three fake sites generated from the original by changing the original typography. Screenshots of each site were used as stimuli.

Design & Procedure

Participants were asked to categorize screenshots as belonging to the original or to a fake website. Feedback about the actual category was provided after each response.

Easy-to-hard group (ETH) was trained progressively, starting with the easiest version of the task (O vs. F₁) and finishing with the hardest one (O vs. F₃), whereas Hard-to-hard (HTH) group was trained only with the hardest level of difficulty.

Results & Discussion

Discriminative training was not enough to improve Internet users' skills for detecting perceptual differences between the most difficult-to-discriminate pair of stimuli. **No improvements along training were detected in HTH group**, Friedman's test $X^2(3)=6.69$, $p>.05$. However, progressive training seems to be an effective option for identifying differences in this context.

Participants in ETH group showed better discrimination on the last block of test trials than those in HTH group, Mann-Whitney $U=135$, $Z=-2.142$, $p=0.03$.

These results confirmed an advantage of progressive training using a task that requires participants to acquire a subtle discrimination based on a complex and unfamiliar dimension.

More research is needed in order to specify progressive training utility in this context, and the potential effectiveness of educational programs including perceptual strategies aimed at protecting Internet users against phishing.

References

- Arriola, N., Alonso, G., & Rodríguez, G. (2015). Progressively increasing the difficulty of a Pavlovian discrimination in a voluntary exposure to toxin paradigm with rats attenuates the magnitude of the easy-to-hard effect. *Learning and Motivation*, 49, 6-13.
Lawrence, D. H. (1952). The transfer of a discrimination along a continuum. *Journal of Comparative and Physiological Psychology*, 45, 511-516.
Moreno-Fernández, M. M., Ramos-Álvarez, M. M., Paredes-Olay, C., & Rosas, J. M. (2012). Effects of progressively increasing the difficulty of training on sensitivity and strategic factors in olive oil tasting. *Food Quality and Preference*, 24, 225-229.

TYPEFACE	ROLE	DISCRIMINATION
Verdana	Original (O)	--
Times New Roman	Fake 1 (F ₁)	Easy
Capriola	Fake 2 (F ₂)	Medium
Tahoma	Fake 3 (F ₃)	Hard

GROUP	TRAINING		TEST	
	Phase 1	Phase 2	Test 1	Test 2
ETH	6O, 6F ₁	6O, 6F ₂	6O, 6F ₃	6O, 6F ₃
HTH	6O, 6F ₃	6O, 6F ₃		

