

# Signal detection theory – taste of advanced topics

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# Again experiment with faces

- Participants are shown faces to remember them



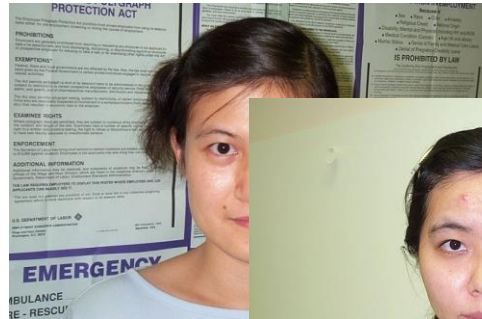
- They are queried after 10minutes and after 7 days

# We add rating of confidence

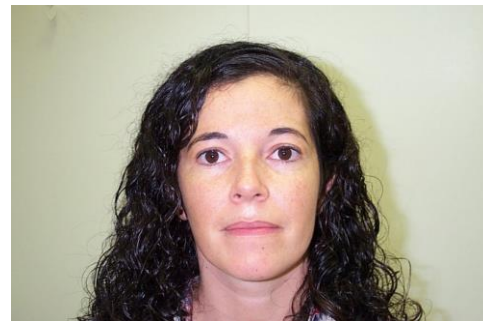
- Participants are shown faces to remember them



old



new



Not sure at all

Somewhat sure

Very sure



# Data

Type of stimuli	Old			New			Total
	Very sure	Somewhat sure	Not sure at all	Not sure at all	Somewhat sure	Very sure	
10 minutes							
Old	112	112	72	53	22	4	375
New	7	38	50	117	101	62	375
7 days							
Old	49	94	75	60	75	22	375
New	8	37	45	60	113	113	375

If we ignore confidence

	<i>10-Minute Delay</i>		<i>7-Day Delay</i>	
	<i>"Yes"</i>	<i>"No"</i>	<i>"Yes"</i>	<i>"No"</i>
Old ( $S_2$ )	296	79	218	157
New ( $S_1$ )	95	280	90	285

<i>10-Minute Delay</i>	<i>7-Day Delay</i>
$H = 296/375 = .79$	$H = 218/375 = .58$
$F = 95/375 = .25$	$F = 90/375 = .24$
$d' = 1.48$	$d' = 0.91$

# With confidence rating

- Finer division allows us to compute multiple  $d'$  for different thresholds

Type of stimuli		Old		New			Total
	Very sure	Somewhat sure	Not sure at all	Not sure at all	Somewhat sure	Very sure	
10 minutes							
Old	112	112	72	53	22	4	375
New	7	38	50	117	101	62	375
7 days							
Old	49	94	75	60	75	22	375
New	8	37	45	60	113	113	375

# With confidence rating

- Or this

Type of stimuli	Old			New			Total
	Very sure	Somewhat sure	Not sure at all	Not sure at all	Somewhat sure	Very sure	
10 minutes							
Old	112	112	72	53	22	4	375
New	7	38	50	117	101	62	375
7 days							
Old	49	94	75	60	75	22	375
New	8	37	45	60	113	113	375

# With confidence rating

- Or this, in general, we have n-1 division lines

Type of stimuli	Old			Not sure at all	New		Total
	Very sure	Somewhat sure	Not sure at all		Somewhat sure	Very sure	
10 minutes							
Old	112	112	72	53	22	4	375
New	7	38	50	117	101	62	375
7 days							
Old	49	94	75	60	75	22	375
New	8	37	45	60	113	113	375



# How to compute d's

- We start with counts

	<i>"Old"</i>			<i>"New"</i>			<i>Total</i>
	<i>"3"</i>	<i>"2"</i>	<i>"1"</i>	<i>"1"</i>	<i>"2"</i>	<i>"3"</i>	
<i>10-Minute Delay</i>							
<i>Old</i>	112	112	72	53	22	4	375
<i>New</i>	7	38	50	117	101	62	375
<i>7-Day Delay</i>							
<i>Old</i>	49	94	75	60	75	22	375
<i>New</i>	8	37	45	60	113	113	375

# How to compute d's

- Then we compute relative frequency (to row total)

	<i>"Old"</i>			<i>"New"</i>			<i>Total</i>
	<i>"3"</i>	<i>"2"</i>	<i>"1"</i>	<i>"1"</i>	<i>"2"</i>	<i>"3"</i>	
<i>10-Minute Delay</i>							
Old	.299	.299	.192	.141	.059	.011	1.00
New	.019	.101	.133	.312	.269	.165	1.00
<i>7-Day Delay</i>							
Old	.131	.251	.200	.160	.200	.059	1.00
New	.021	.099	.120	.160	.301	.301	1.00

# How to compute d's

- We compute cumulative relative frequency

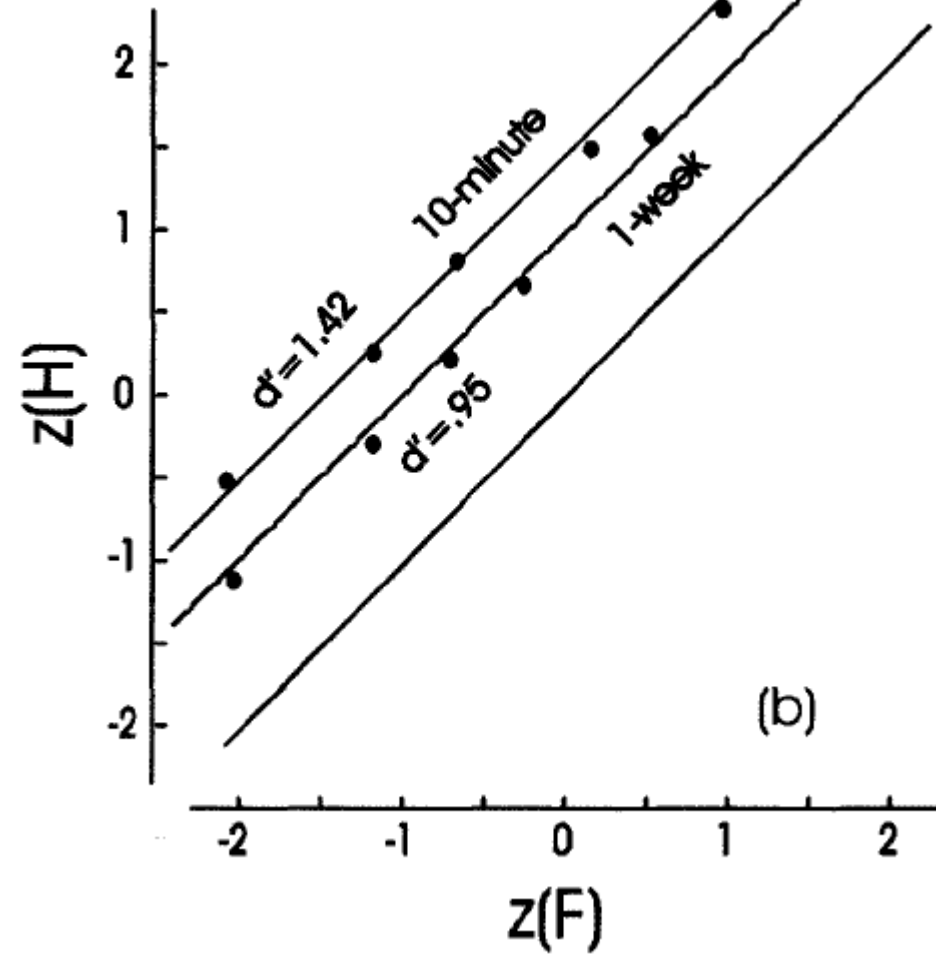
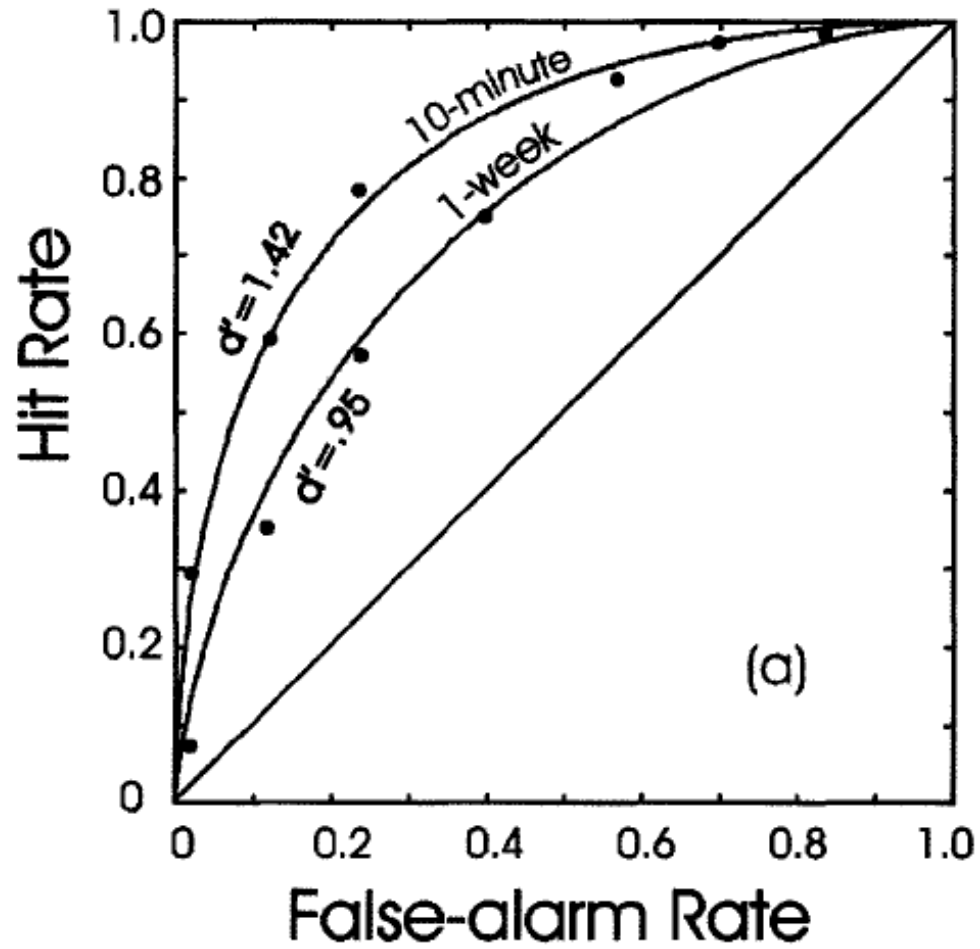
	<i>"Old"</i>			<i>"New"</i>		
	<i>"3"</i>	<i>"2"</i>	<i>"1"</i>	<i>"1"</i>	<i>"2"</i>	<i>"3"</i>
<i>10-Minute Delay</i>						
Old	.299	.598	.790	.931	.990	1.00
New	.019	.120	.253	.565	.834	1.00
<i>7-Day Delay</i>						
Old	.131	.382	.582	.742	.942	1.00
New	.021	.120	.240	.400	.701	1.00

# How to compute $d'$ s

- And finally, we convert cumulative relative frequency to z-scores and corresponding  $d'$

	<i>"Old"</i>			<i>"New"</i>	
	<i>"3"</i>	<i>"2"</i>	<i>"1"</i>	<i>"1"</i>	<i>"2"</i>
<i>10-Minute Delay</i>					
Old	-0.527	0.232	0.807	1.484	2.327
New	-2.081	-1.175	-0.665	0.164	0.970
$d'$	1.554	1.407	1.472	1.320	1.357
<i>7-Day Delay</i>					
Old	-1.121	-0.301	0.207	0.649	1.573
New	-2.037	-1.175	-0.706	-0.253	0.527
$d'$	0.916	0.874	0.913	0.902	1.046

In form ROC curve



# Another example

- Recognition of low-frequency and high frequency words.

