

Change Blindness in Military Information Displays: Effect of Icon Position Change

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Introduction

Background

- Change Blindness refers to the “failure to detect what should be a fairly obvious visual change” (Durlach, 2004)
- Force XXI Battle Command Brigade and Below (FBCB2), uses digital technology to enable soldiers to monitor, and Command and Control combat operations
- Soldiers may miss information while monitoring the visual information displays of FBCB2 due to change blindness

Introduction

Literature Review

- Durlach (2004) and Zelinsky (2001)
 - blindness to change in military information displays could threaten the mission
 - As display complexity increases, likelihood of change blindness increases
- Resnick (2003)
 - “Change blindness blindness”
 - Change blindness more likely for peripheral objects
- Simons (2000)
 - Change blindness is more likely for gradual changes

Introduction

Purpose of Current Study

- To evaluate the effect of type icon position change on change blindness when using FBCB2

Hypotheses

- The probability of detecting ‘control moves’ is greater than the probability of detecting gradual moves.
- Given, that an icon position change is detected, response times for detecting control moves will not be significantly different than for gradual moves

Method

Participants

- 10 freshman undergraduates from general psychology (awarded extra credit for participation) with normal color vision
- Age of students ranged from 10 (7 men, 2 women)

Apparatus

- 1 Dell Dimension 8200 PC
- 1 Dell Dimension 2300 PC



Method

Procedure

- Within Subjects Design
- Independent Variable: Type of Movement
 - Control Move (One discrete move, 17.5 mm)
 - Gradual Move (A series of 10 incremental moves, 1.75mm)
- Dependant Variables:
 - Number of Correct Detections
 - Response Time (in ms)
- Participants were:
 - Introduced to FBCB2 and experimental task
 - Tested for color blindness
 - Monitored an FBCB2 and reported observed changes

The Display

FBCB2 Display Process UNCLASSIFIED

231352ZOCT2002 R 0 0 0 0

Grab Zoom View

Nav... --- Auto Center

FIPR 0... Top...

PSG1/B/3BN66AR U

10TGS 17426 77381

F1 Map... F2 Filters...

F3 Combat Msgs... F4 Messages...

F5 Status... F6 Admin...

F7 Apps... F8 Help

1x ▼ 13:52

...

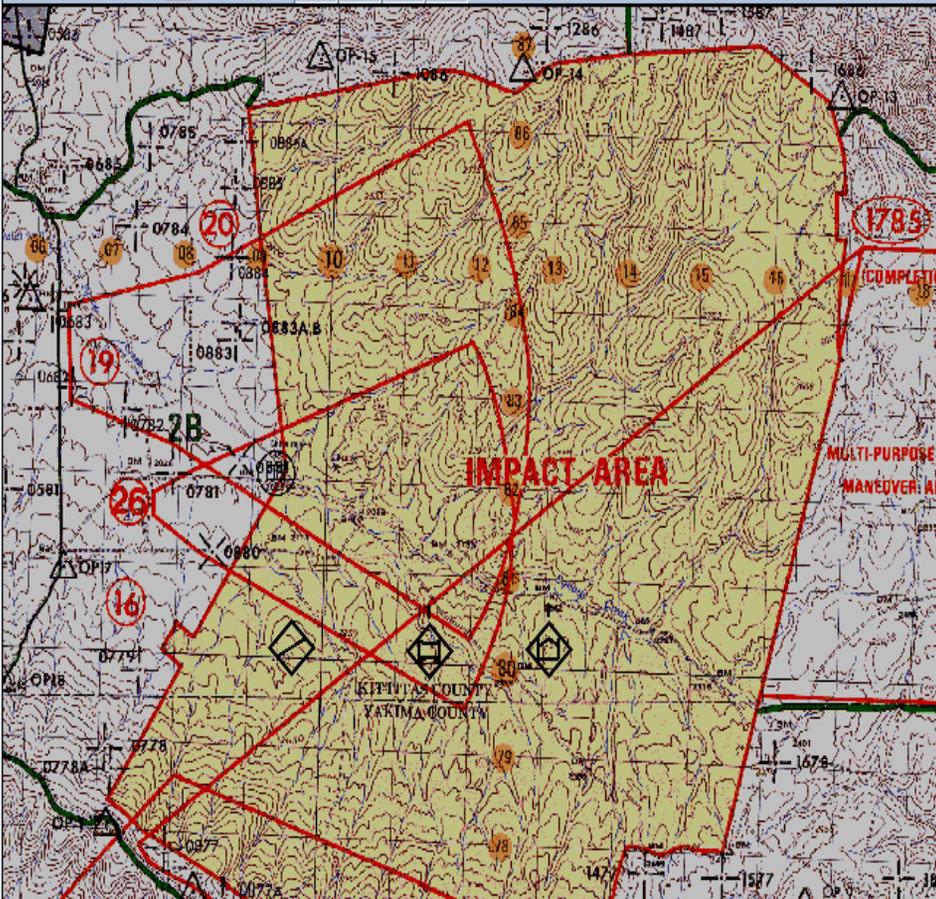
Setup Trial Execution Control & Summary

Stop Trial

Log Out

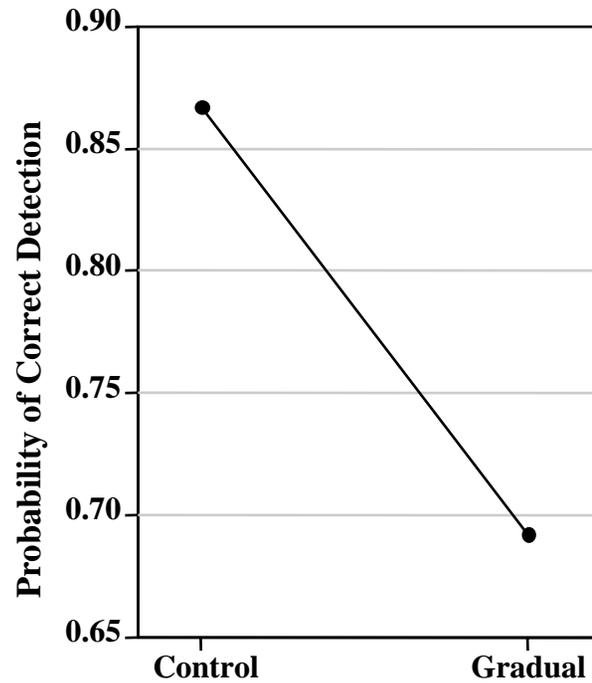
Detected An Event

Please use 'Apps...' to setup a periodic REMINDER at 1300 every Tuesday for lunch with Company

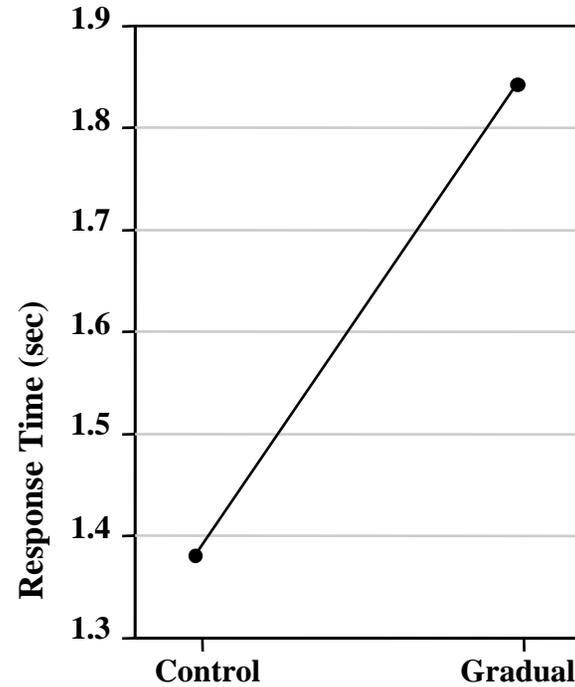


The map displays a topographic terrain with contour lines. A large red-outlined polygon is labeled "IMPACT AREA". Within this area, several circular markers are numbered in red: 16, 19, 20, 26, and 1789. The marker 1789 is circled in red and labeled "COMPLETI". Other markers include 0785, 0784, 0781, 0778, 0777, 0772, 0771, 0685, 0683, 0683A, B, 0682, 0681, 0680, 0679, 0678, 0677, 0676, 0675, 0674, 0673, 0672, 0671, 0670, 0669, 0668, 0667, 0666, 0665, 0664, 0663, 0662, 0661, 0660, 0659, 0658, 0657, 0656, 0655, 0654, 0653, 0652, 0651, 0650, 0649, 0648, 0647, 0646, 0645, 0644, 0643, 0642, 0641, 0640, 0639, 0638, 0637, 0636, 0635, 0634, 0633, 0632, 0631, 0630, 0629, 0628, 0627, 0626, 0625, 0624, 0623, 0622, 0621, 0620, 0619, 0618, 0617, 0616, 0615, 0614, 0613, 0612, 0611, 0610, 0609, 0608, 0607, 0606, 0605, 0604, 0603, 0602, 0601, 0600, 0599, 0598, 0597, 0596, 0595, 0594, 0593, 0592, 0591, 0590, 0589, 0588, 0587, 0586, 0585, 0584, 0583, 0582, 0581, 0580, 0579, 0578, 0577, 0576, 0575, 0574, 0573, 0572, 0571, 0570, 0569, 0568, 0567, 0566, 0565, 0564, 0563, 0562, 0561, 0560, 0559, 0558, 0557, 0556, 0555, 0554, 0553, 0552, 0551, 0550, 0549, 0548, 0547, 0546, 0545, 0544, 0543, 0542, 0541, 0540, 0539, 0538, 0537, 0536, 0535, 0534, 0533, 0532, 0531, 0530, 0529, 0528, 0527, 0526, 0525, 0524, 0523, 0522, 0521, 0520, 0519, 0518, 0517, 0516, 0515, 0514, 0513, 0512, 0511, 0510, 0509, 0508, 0507, 0506, 0505, 0504, 0503, 0502, 0501, 0500, 0499, 0498, 0497, 0496, 0495, 0494, 0493, 0492, 0491, 0490, 0489, 0488, 0487, 0486, 0485, 0484, 0483, 0482, 0481, 0480, 0479, 0478, 0477, 0476, 0475, 0474, 0473, 0472, 0471, 0470, 0469, 0468, 0467, 0466, 0465, 0464, 0463, 0462, 0461, 0460, 0459, 0458, 0457, 0456, 0455, 0454, 0453, 0452, 0451, 0450, 0449, 0448, 0447, 0446, 0445, 0444, 0443, 0442, 0441, 0440, 0439, 0438, 0437, 0436, 0435, 0434, 0433, 0432, 0431, 0430, 0429, 0428, 0427, 0426, 0425, 0424, 0423, 0422, 0421, 0420, 0419, 0418, 0417, 0416, 0415, 0414, 0413, 0412, 0411, 0410, 0409, 0408, 0407, 0406, 0405, 0404, 0403, 0402, 0401, 0400, 0399, 0398, 0397, 0396, 0395, 0394, 0393, 0392, 0391, 0390, 0389, 0388, 0387, 0386, 0385, 0384, 0383, 0382, 0381, 0380, 0379, 0378, 0377, 0376, 0375, 0374, 0373, 0372, 0371, 0370, 0369, 0368, 0367, 0366, 0365, 0364, 0363, 0362, 0361, 0360, 0359, 0358, 0357, 0356, 0355, 0354, 0353, 0352, 0351, 0350, 0349, 0348, 0347, 0346, 0345, 0344, 0343, 0342, 0341, 0340, 0339, 0338, 0337, 0336, 0335, 0334, 0333, 0332, 0331, 0330, 0329, 0328, 0327, 0326, 0325, 0324, 0323, 0322, 0321, 0320, 0319, 0318, 0317, 0316, 0315, 0314, 0313, 0312, 0311, 0310, 0309, 0308, 0307, 0306, 0305, 0304, 0303, 0302, 0301, 0300, 0299, 0298, 0297, 0296, 0295, 0294, 0293, 0292, 0291, 0290, 0289, 0288, 0287, 0286, 0285, 0284, 0283, 0282, 0281, 0280, 0279, 0278, 0277, 0276, 0275, 0274, 0273, 0272, 0271, 0270, 0269, 0268, 0267, 0266, 0265, 0264, 0263, 0262, 0261, 0260, 0259, 0258, 0257, 0256, 0255, 0254, 0253, 0252, 0251, 0250, 0249, 0248, 0247, 0246, 0245, 0244, 0243, 0242, 0241, 0240, 0239, 0238, 0237, 0236, 0235, 0234, 0233, 0232, 0231, 0230, 0229, 0228, 0227, 0226, 0225, 0224, 0223, 0222, 0221, 0220, 0219, 0218, 0217, 0216, 0215, 0214, 0213, 0212, 0211, 0210, 0209, 0208, 0207, 0206, 0205, 0204, 0203, 0202, 0201, 0200, 0199, 0198, 0197, 0196, 0195, 0194, 0193, 0192, 0191, 0190, 0189, 0188, 0187, 0186, 0185, 0184, 0183, 0182, 0181, 0180, 0179, 0178, 0177, 0176, 0175, 0174, 0173, 0172, 0171, 0170, 0169, 0168, 0167, 0166, 0165, 0164, 0163, 0162, 0161, 0160, 0159, 0158, 0157, 0156, 0155, 0154, 0153, 0152, 0151, 0150, 0149, 0148, 0147, 0146, 0145, 0144, 0143, 0142, 0141, 0140, 0139, 0138, 0137, 0136, 0135, 0134, 0133, 0132, 0131, 0130, 0129, 0128, 0127, 0126, 0125, 0124, 0123, 0122, 0121, 0120, 0119, 0118, 0117, 0116, 0115, 0114, 0113, 0112, 0111, 0110, 0109, 0108, 0107, 0106, 0105, 0104, 0103, 0102, 0101, 0100, 0099, 0098, 0097, 0096, 0095, 0094, 0093, 0092, 0091, 0090, 0089, 0088, 0087, 0086, 0085, 0084, 0083, 0082, 0081, 0080, 0079, 0078, 0077, 0076, 0075, 0074, 0073, 0072, 0071, 0070, 0069, 0068, 0067, 0066, 0065, 0064, 0063, 0062, 0061, 0060, 0059, 0058, 0057, 0056, 0055, 0054, 0053, 0052, 0051, 0050, 0049, 0048, 0047, 0046, 0045, 0044, 0043, 0042, 0041, 0040, 0039, 0038, 0037, 0036, 0035, 0034, 0033, 0032, 0031, 0030, 0029, 0028, 0027, 0026, 0025, 0024, 0023, 0022, 0021, 0020, 0019, 0018, 0017, 0016, 0015, 0014, 0013, 0012, 0011, 0010, 0009, 0008, 0007, 0006, 0005, 0004, 0003, 0002, 0001, 0000.

Results



$F(1, 9) = 3.556$ $p = 0.09$



$F(1, 9) = 8.167$ $p = 0.019$

Discussion

Hypothesis

- Soldiers were not significantly more likely to detect control moves than gradual moves
- When soldiers detected moves, they detected control moves faster (with lower response times)

Conclusions

- Aspects of change blindness may depend upon attributes of change being detected (control vs. gradual)
- With more research, displays might be augmented with attentional cues designed to reduce probability of change blindness and the slower reaction times affiliated with certain types of changes.

Discussion

Future Research

- Run more subjects
- Investigate attributes of changes (other than control vs. gradual)
- Investigate attributes of the observer (such as fatigue)
- Investigate attributes of the target (such as icon color, platform, quadrant location)

Thank you for your attention!

Change Blindness in Military
Information Displays: Effect of
Icon Position Change

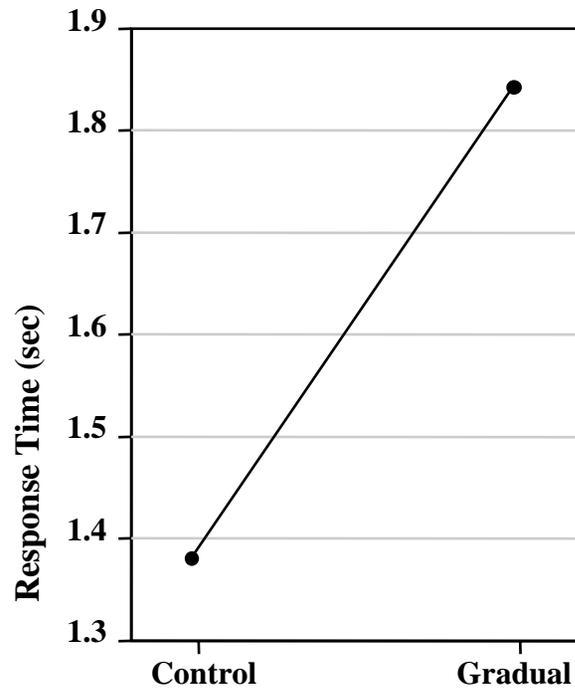
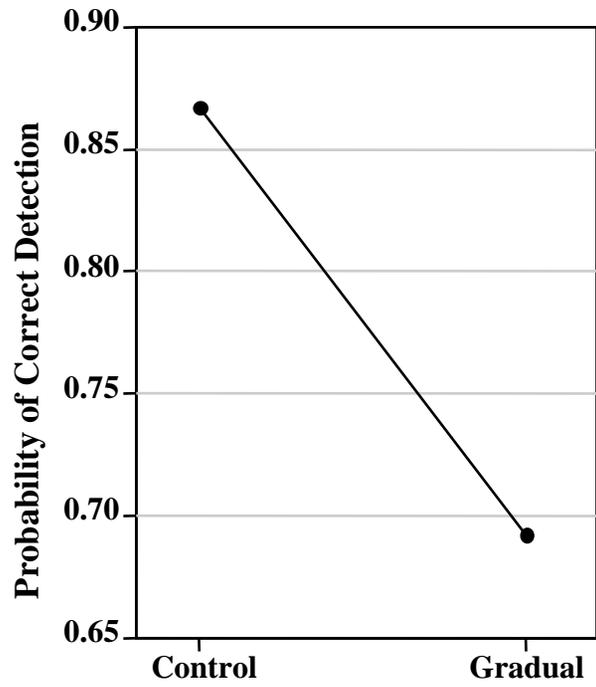
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Questions & Discussion...

References

- Durlach, Paula J. “*Army Digital Systems and Vulnerability to Change Blindness.*” U.S. Army Research Institute for the Behavioral and Social Sciences (2004).
- Rensick, Ron. “*A Lack of Vision: You Don’t See As Much As You Think You Do.*” Boston Globe (15 April 2003); pg. C.1. [journal online]. Internet [proquest]. Accessed 12 September 2004.
- Simons, D.L., Franconeri, S.L. & Reimer, R.L. (2000). “*Change Blindness in the absence of a visual disruption*” Perception. Volume 29, p. 1143-1154.
- Zelinsky, G.J.: “*Eye Movements During Change Detection: Implications for search constraints, memory limitations, and scanning strategies.*” Perception and Psychophysics. Volume 63, p. 209-225.



First semester results (??)

