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The impact of inspector's cognitive style on performance in various visual inspection display tasks

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The impact of inspector's cognitive style on performance in various visual inspection display tasks

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I would like to offer my regards and blessings to Peihan Zhong and Kristopher Watts who supported and helped me during the completion of the project.

Lastly, I dedicate this thesis to my parents and I am deeply indebted to them for their continuous support.

ABSTRACT

Three aspects of visual inspection were considered in this study. Cognitive styles, feedforward training (job aid), and pacing would have effects on inspection performance. In this study, the Matching Familiar Figures Test (MFFT) was administrated and the basic (control), static (self-pacing), and hybrid (systematic pacing) displays were used to investigate the pacing effect. The objectives are not only to classify the inspectors into different categories via the MFFT based on their cognitive styles, but also to investigate inspection performance (accuracy and response time) affected by the job aids as cognitive styles are also concerned. The results indicate that the MFFT is effective in all task conditions and job aid has positive impact on performance.

INTRODUCTION

Since defects occur in the manufacturing process, human visual inspections are needed for quality control. Drury (1990) presented a model of inspection as two-component process: "(1) a search, which, if successful, (2) requires some level of decision making." However, some inspectors might not make the appropriate decisions or perform well during the inspection process. There are some studies being done in the past which focused on different aspects to investigate how to improve the inspectors' accuracy and efficiency in visual inspection. For example, Gallwey and Drury (1986) manipulated the complexity of inspection tasks which was represented as the number of different types of flaw (two, four, or six types). They found that inspection performance decreased as the number of fault types increased. Furthermore, since decision making is important for visual inspection, McDonald and Gramopadhye (1998) focused on subjects' decision making performance by studying the effect of different conditions of pacing and cost tradeoffs (reward or penalty given based on decision making outcomes).

Cognitive styles may also have impacts on the human visual inspection performance according to some literature. The individual difference between inspectors plays an important role for evaluating the inspection performance. Several approaches have been proposed to classify and select inspectors for visual inspection in many studies (Gallwey, 1982; Schwabish and Drury, 1984; Drury and Chi, 1995; Gramopadhye, Drury, and Sharit, 1997; Chi and Drury, 1998). Gallwey (1982) used ten selection tests in his study, i.e., visual acuity, Harris Inspection Test, Eysenck personality inventory, questionnaire on mental imagery (QMI), card sorting, intelligence (IQ), Embedded Figures Test (EFT), single fault type inspection, visual lobe size, and short-term memory (STM). He concluded that EFT (especially for geometrical type tasks), visual lobe size, and mental imagery were good predictors of inspection performance. Schwabish and Drury (1984) designed an experiment to evaluate the influence of the reflective-impulsive cognitive style on visual inspection. According to the results of the Matching Familiar Figures Test (MFFT), e.g., response time and accuracy, subjects in their study were classified into four different cognitive styles: fast-accurates (spend shorter times, make fewer errors), reflectives (spend longer times, make fewer errors), impulsives (spend shorter times, make more errors), and slow-inaccurates (spend longer times, make more errors). Their results indicated that there was a MFFT grouping phenomenon based on the accuracy dimension. The accurate group (i.e., reflectives and fast-accurates) was faster than the inaccurate (i.e., impulsives and slow-inaccurates), and made fewer size-judgment errors. However, the inaccurate had higher probability of search success than the accurate.

Moreover, training is a major method to improve human visual inspection performance. The human search process can be classified into random and systematic search, but in reality, it lies in between. Previous studies indicated a systematic search strategy is more effective than a random search strategy, and the search strategy can be improved by training. In order to learn the systematic search strategy, various job aids were used for training inspectors, such as using a cursor to trace the search pattern. Nickles, Sacrez, and Gramopadhye (1998) asked subjects to search the area as the cursor moved along the zigzag path only with their eyes in low or high complexity tasks. The speed of a cursor is also manipulated with different levels of task complexity, i.e., background density, fault probability, background characters, and fault mix (Koenig, Gramopadhye, and Melloy, 2002). The results showed that accuracy was decreased as the speed of cursor (which inferred speed-accuracy trade-off; Drury, 1994) or task complexity increased. They also proposed the appropriate speed of cursor for specific condition, for example, medium speed for middle complexity task. Furthermore, Tetteh et al. (2008) evaluated the job aid in inspection systems with different search orientations (e.g., horizontal, vertical, and diagonal), complexity, and pacing effect. They found that the horizontal search strategy was better than either vertical or diagonal search strategy.

Additionally, there are various training interventions proposed by Drury and Gramopadhye (1992) in an aircraft visual inspection experiment. These are visual lobe training, feedback training, feedforward training, attribute training, and schema training. Furthermore, Kaufman, Gramopadhye, and Kimbler (2000) summarized several training methods and suggested an approach on how to develop an inspection training program. Regarding corrective information (feedback or feedforward), feedback can be categorized as performance and cognitive feedback (Gramopadhye, Drury, and Prabhu, 1997; Gramopadhye, Drury, and Sharit, 1997; Ma, Drury, and Bisantz, 2002). Search times, search errors, and decision errors can be given as the performance feedback. Cognitive feedback provides information about the search process (e.g., the areas being inspected) or strategy inspectors used during the task. Cognitive feedback is also known as process feedback for visual inspection tasks. Feedforward, the other corrective information, provides hints about what and where should be perceived (prior information). In other words, feedback infers “you looked here” and feedforward implies “you should look here” (Sadasivan, Greenstein, Gramopadhye, and Duchowski, 2005).

Feedback is a well-known training method in visual inspection and it has shown positive impacts on inspection performance in many studies. For example, Gramopadhye, Drury, and Sharit (1997) compared two kinds of feedback: (1) performance feedback (e.g., time and percentage of faults detected), and (2) cognitive/process feedback (e.g., statistical and graphical feedback). In their experiment, before training, two cognitive style tests (i.e., the Matching Familiar Figures Test and Embedded Figures Test) were given to all the subjects. Their results showed that subjects given feedback performed better than those in a control group without feedback. Nickles III, Melloy, and Gramopadhye (2003) presented three types of feedforward training for investigating systematic search behavior in visual inspection: (1) only verbal instruction, (2) a static display of a systematic search pattern with verbal instruction, and (3) a systematic pacing dynamic cursor which traces a systematic search pattern and a static display with verbal instruction. Their results showed that all three feedforward training had positive impacts on performance and process measures, and there were no significant differences between the three types of training. Three feedforward displays (i.e., static, dynamic, and hybrid) were evaluated by Nalanagula, Greenstein, and Gramopadhye (2006) in a visual inspection experiment of printed circuit board (PCB) images. In their study, dynamic display only included a systematic pacing cursor without the static pattern shown on screen, whereas the hybrid display combined dynamic cursor with a static trace. Based on their results, they recommended hybrid or dynamic feedforward display for PCB inspection tasks, especially for novice inspectors.

From many viewpoints, cognitive styles and training interventions are both notable factors that affect human performance in the visual inspection. Regarding the four cognitive styles categorized by MFFT, the relationship between speed and accuracy might be a critical effect for inspectors' performance. As the pacing effect could be manipulate by using the static (self-pacing) and hybrid (systematic pacing) displays, the effectiveness of corrective information (static or hybrid feedforward display) on different cognitive styles would studied in order to improve the quality control and increase the customers' satisfaction. In other words, it's beneficial for not only the companies (producers) but also the customers (users). As a result, the objective of this study is first to classify the inspectors into different categories by using the MFFT, based on their cognitive styles. After the classification, human performance (accuracy and response time) affected by feedforward (corrective information) training will be investigated. In other words, the results from the static and hybrid inspection tasks will be compared. Our research hypotheses are as follows:

(1) MFFT is an effective inspector selection test to predict performance in the basic visual inspection task.

(2) The reflective-impulsive cognitive style still has an impact on visual inspection performance in the static and hybrid conditions.

(3) There is a relationship between pacing and cognitive style. That is, the hybrid display is not beneficial for any type of cognitive styles.

EXPERIMENT 1

This experiment was conducted to verify the effectiveness of MFFT of predicting performance in the basic visual inspection task. The method and procedure presented by Schwabish and Drury in 1984 were applied in this experiment. However, only four flaw sizes (tiny, small, medium, and large) were represented in this study instead of five sizes (tiny, small, medium, large, and huge), since, according to Schwabish and Drury's findings, the results of huge size would likely be similar to the results of large size. In addition, a computer-based visual inspection task was used instead of projecting slides on a white screen. Simplified search and decision trainings (i.e., fewer practice slides) were applied and only 48 slides of visual inspection task were included in the basic condition.

Method

Participants. Ninety-eight subjects, aged 18 to 61, were recruited. They all had natural or corrected 20-20 vision. The subjects were compensated for their participation. Only seventy-one of them were available to be classified regarding cognitive styles via MFFT. The basic (self-pacing, verbal and written instructions) tasks were assigned to each subject.

MFFT. The Matching Familiar Figures Test (MFFT) originally developed by Kagan et al. (1964) was used to classify subjects into fast-accurates, reflectives, impulsives, and slow-inaccurates (Schwabish and Drury, 1984). The more reliable version of MFFT, i.e., MFFT-20, was developed and used in several studies (Cairns and Cammock, 1978; Carretero-Dios, De los Santos-Roig, and Buela-Casal, 2008; Carretero-Dios, De los Santos-

Roig, and Buela-Casal, 2009). Additionally, Hummel-Schluger and Baer (1996) suggested a computer version of the MFFT as an alternative to traditional method (hand administration) of the MFFT, since experimenters interfered less with the participants using the computer version. In this study, a MFFT-20 program was designed based on an online adult version of the MFFT developed by Franziska Spring and Patrick Meier (Educational Engineering Lab, University of Zurich, Switzerland) in collaboration with Anja Schumann and Tommy Cammock (School of Psychology, University of Ulster, United Kingdom).

Stimulus materials. The simulated inspection tasks were run on desktops. The search field included a target (defect; [ ) and the background which consists of 10 different characters (%, $, *, @, ^, –, ?, &, =, ⊥) with 20% background density (Schwabish and Drury, 1984). The single target could be found anywhere in the search field and in one of the four sizes (tiny, small, medium, and large shown in Figure 1 and Table 1). There were 48 screens in a visual inspection task and each search field consisted of 20 rows and 60 columns. Each target size was presented three times, i.e., 25% of screens included the single target whereas 75% did not. Moreover, tiny and large targets were to be rejected whereas small and medium accepted. The screens which did not contain the target were supposed to be accepted as well.

Figure 1. The comparison of flaw sizes.

TABLE 1: The heights of the target character and others

	Tiny target	Small target	Medium target	Large target	other characters
Height (mm)	2	3	4	5	4

Experimental design. The flaw size as the independent variable has four sizes: tiny, small, medium, and large; the cognitive style as the independent variable has four styles: fast-accurates, impulsives, reflectives, and slow-inaccurates. Dependent variables are accuracy and response time. Within-subject design is used to analyze the effect of size, whereas between-subject design is applied to investigate the effect of cognitive style.

Procedure. All participants were tested in a computer laboratory and they were given a MFFT instruction visually and required to complete a computer version of MFFT first. They were asked to indicate their responses on the screen and computer recorded their responses (time and accuracy). In this test, participants were required to select the same figure from six variants by comparing with the standard. If the first response was not correct, they were told to choose again. The participants would proceed to the next set of figures if they had the correct answer or they made six consecutive wrong responses. After they were done with 20 sets of figures, the basic inspection task was given after five minutes break.

The instructions and simplified training (Czaja and Drury, 1981) for inspection task were given before the tasks. Participants were asked to search horizontally (zigzag path) for a specific target character (defect; [ ) in the search field shown in Figure 2. Participants had a 60 second time limit for each screen. Whenever they found the target, they needed to click on it using the mouse and judge which size it was. After the size judgment, they were also required to decide to either accept or reject. If there was no target, they should click on accept button. Once participants clicked on either accept or reject button, the next screen would be displayed. Their responses (time and accuracy) were recorded during the experiment.

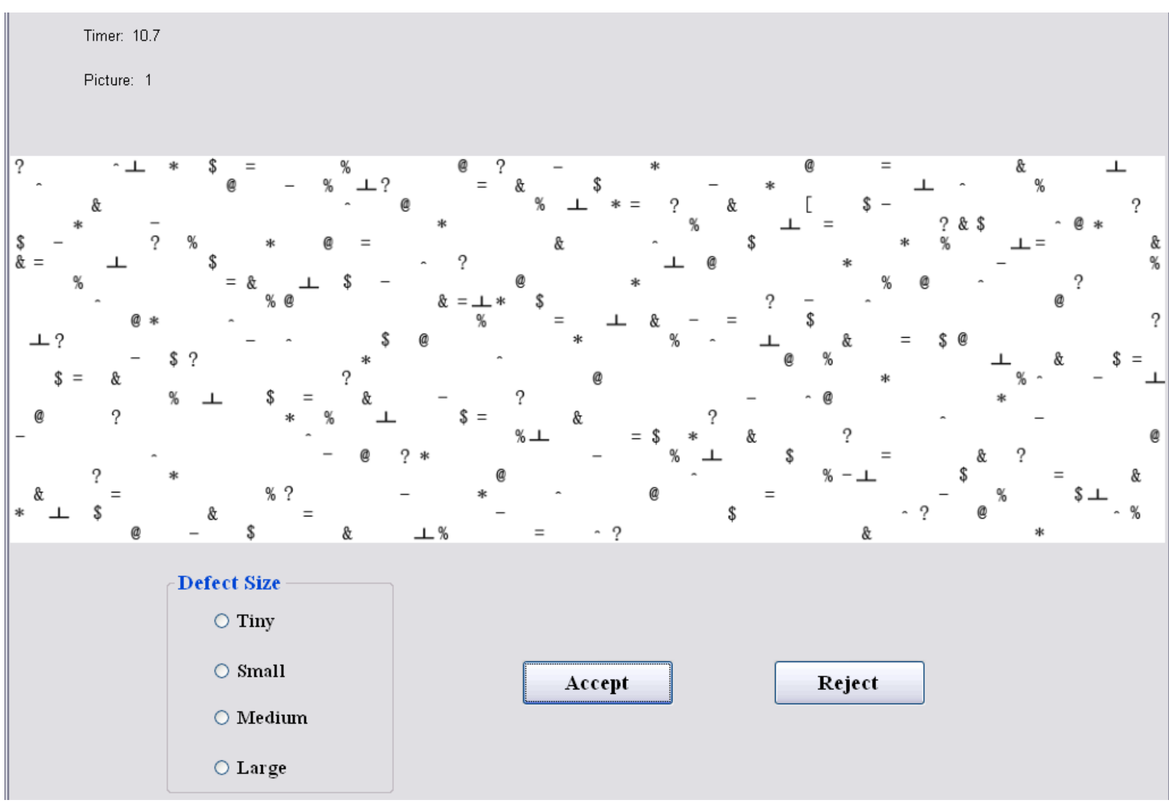

Figure 2. The basic pattern.

Results and Discussion

MFFT. From the results of the MFFT, the correlation between total number of errors and average time to first response was -0.76, a negative correlation also found in previous studies. Median total number of errors (7) and median average time to first response (15.055 seconds) were used to classify participants into four cognitive styles. Although 98 subjects participated in our study, some of them were screened out due to misunderstanding of the instructions (e.g., no size-judgment or the opposite decision making based on the size) and double median split criterion illustrated in Figure 3 (e.g., the person falling on the median was not eligible to be classified). In the remaining 71 subjects, 28 of them were reflectives, 26 impulsives, 9 fast-accurates, and 8 slow-inaccurates.

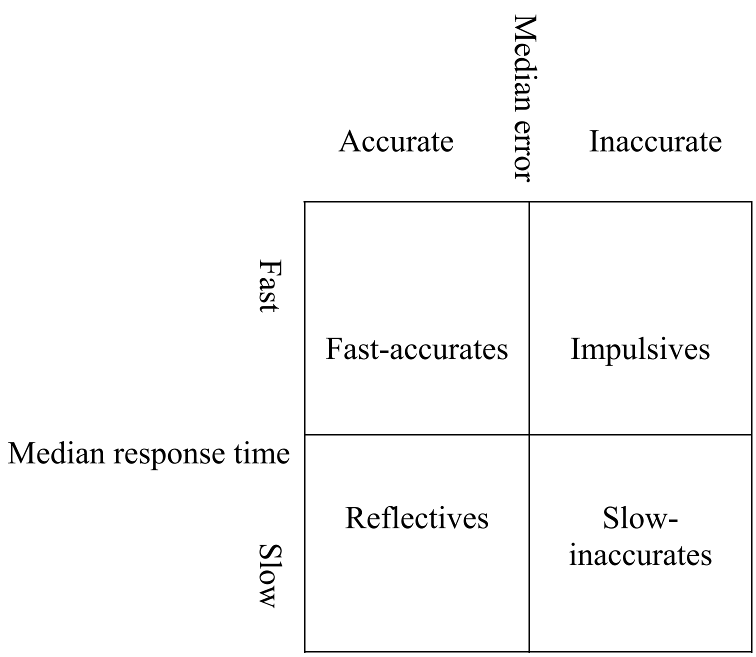

Figure 3. The double median split criterion.

Response time. There were two time measures in visual inspection tasks: (1) stopping time which the subjects used to finish search for a screen without the target (or with the target), and (2) search time which the subjects used to complete search, size judgment, and decision making for a screen with the target. In order to analyze the time measures, the natural logarithm of times was taken to get a normal distribution and satisfy the ANOVA assumption. For stopping time, there was no significant differences between four cognitive styles ($F(3, 67) = 1.53$, $p = 0.2146 > 0.05$). The effects of size and cognitive style on search time were found (Table 2). There was no size × style interaction.

TABLE 2: Size and cognitive style effects on search time (ANOVA)

Cognitive style	$F(3, 276) = 2.96$, $p = 0.0329 < 0.05$
Size	$F(3, 276) = 9.84$, $p < 0.0001$

Results of means comparisons of search time between four cognitive styles using Scheffe's test showed significant differences at the 0.1 level between: fast-accurates and impulsives, fast-accurates and reflectives. There were no significant differences between the following pairs of groups at the 0.1 level: fast-accurates and slow-inaccurates, and impulsives and reflectives, and impulsives and slow-inaccurates, reflectives and slow-inaccurates. Noted that the p-value of the means comparison between impulsives and reflectives was 1.000 and between fast-accurates and slow-inaccurates was 0.880. The relationship between size and search time for different cognitive styles is illustrated in Figure 4. The grouping phenomenon was shown that impulsives and reflectives could be considered as a group, whereas fast-accurates and slow-inaccurates were somehow similar in having shorter search time. The grouping differentiated along neither the MFFT time dimension nor the accuracy dimension. Generally, it took much time to search for the smaller targets (i.e., tiny and small).

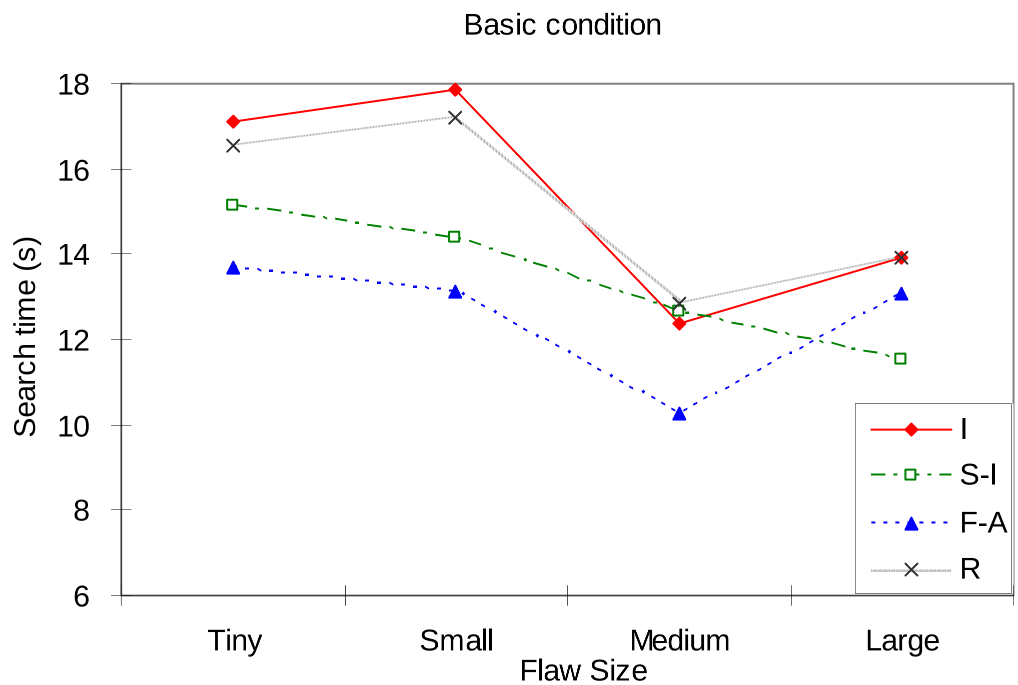

Figure 4. The relationships between size and search time for different cognitive styles in the basic condition.

Accuracy. Four types of error presented by Schwabish and Drury (1984) were also analyzed: "(1) search error: the subject does not detect a flaw on a flawed slide, (2) size-judgment error: the subject locates a flaw but does not successfully identify its size, (3) decision error: the subject locates a flaw, correctly identifies its size, but then makes an incorrect decision based on size, and (4) false-alarm error: the subject detects a flaw on a perfect slide." However, the false-alarm errors were not analyzed since the responses of clicking on anywhere on the perfect screen, except clicking on either accept or reject button, were not recorded.

The probability of correct size-judgment and the probability of correct decision were calculated respectively based on the number of search success and the number of correct size-judgment (Schwabish and Drury, 1984). The results of chi-square goodness-of-fit test for size judgment showed some evidence of size effect on the impulsives ($\chi^2 = 10.25$, $p < 0.05$) and on the reflectives ($\chi^2 = 6.69$, $p < 0.1$). Figure 5a and 5b illustrate the probabilities of search success and correct size judgment across four sizes among four cognitive styles. Generally speaking, it was easier to make the tiny size judgment. The fast-accurates were superior to the others, i.e., they searched faster and made few errors, and also size did not have an impact on the fast-accurates. The grouping phenomenon which concluded as analyzing the search time was not found for accuracy measures. Regarding the decision making about the size, almost all participants would make no decision error for small and medium targets and very few errors for tiny and large targets once they judged the sizes correctly.

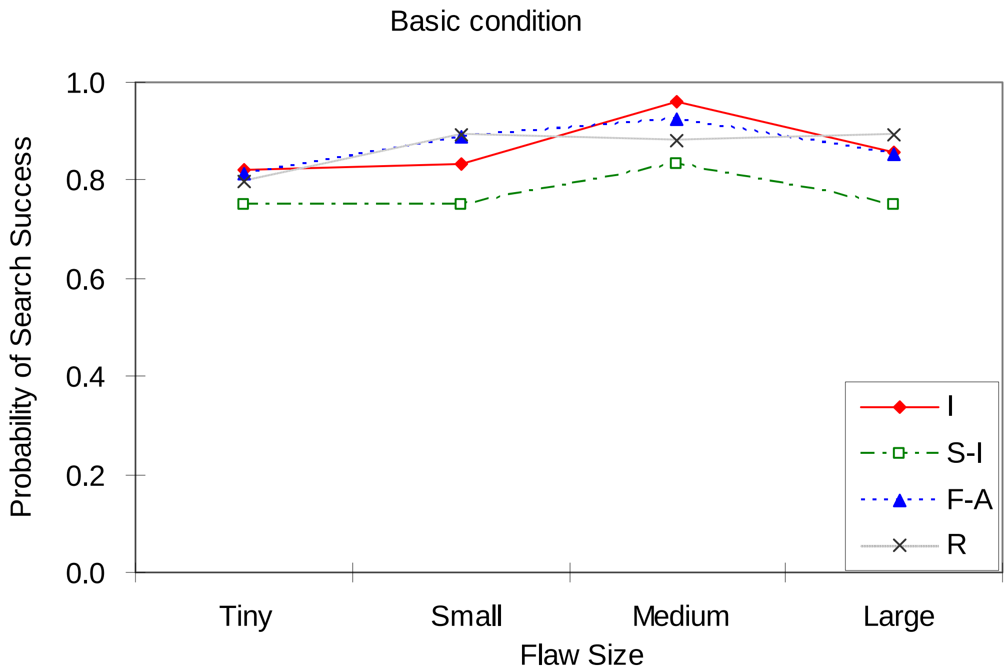

Figure 5a. The relationships between size and search error for different cognitive styles in the basic condition.

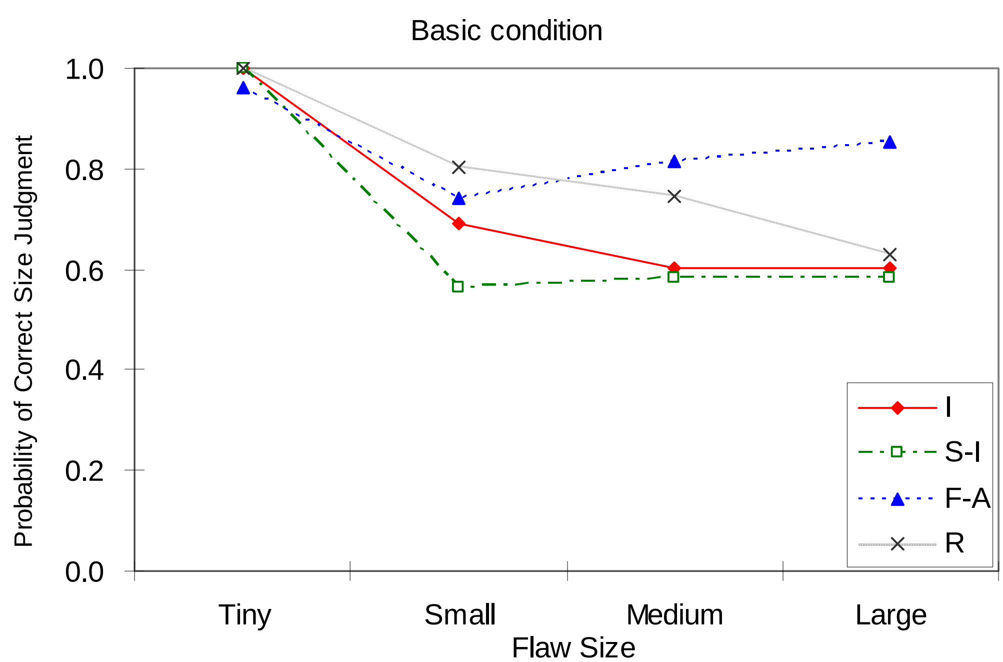

Figure 5b. The relationships between size and size-judgment error for different cognitive styles in the basic condition.

EXPERIMENT 2

In second experiment, proceeded in an other day, the objective was to examine whether the MFFT is also effective to predict visual inspection performance if the job aid (feedforward information) is applied and to study the pacing effect on cognitive styles as comparing performance in the hybrid condition with which in the static condition.

There were two types of inspection tasks: (1) static, self-pacing but with 60 seconds time limit and each screen included static red lines (see Figure 6) and (2) hybrid, systematic pacing and each screen included static red lines and a dynamic cursor (see Figure 7). The dynamic cursor consisted of three asterisks that moved along with the red lines in order to trace the systematic search pattern, and the moving speed was 22 characters per second (Nickles III, Melloy, and Gramopadhye, 2003).

Method

Stimulus materials and experimental design were the same as those in Experiment 1 except applying the feedforward information.

Procedure. Half of the 98 subjects were given the static inspection task and then the hybrid inspection task, whereas others were given in an opposite sequence for counterbalance. There was a five minutes break between two tasks.

The instructions and simplified training for inspection task were given before the tasks as well. For the static task, participants were not allowed to use the mouse to trace red lines. For the hybrid task, they were asked to follow the moving red lines and cursor only with their eyes, not with the mouse. Participants had a 60 second time limit for each screen in the static tasks, whereas in the hybrid task, they had to keep up with the cursor speed. Whenever they found the target, they needed to click on it using the mouse and judge which size it was. After the size judgment, they were also required to decide to either accept or reject. If there was no target, they should click on accept button. Once participants clicked on either accept or reject button, the next screen would be displayed. Their responses (time and accuracy) were recorded during the experiment.

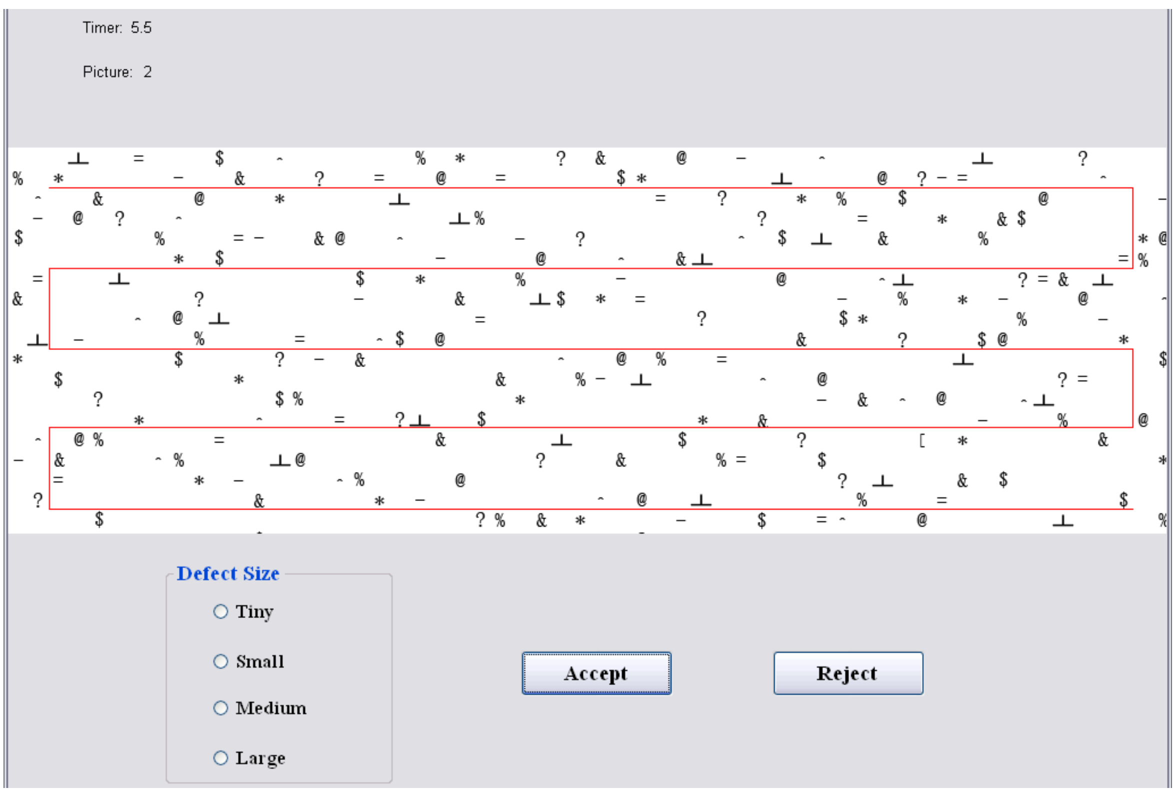

Figure 6. The static pattern.

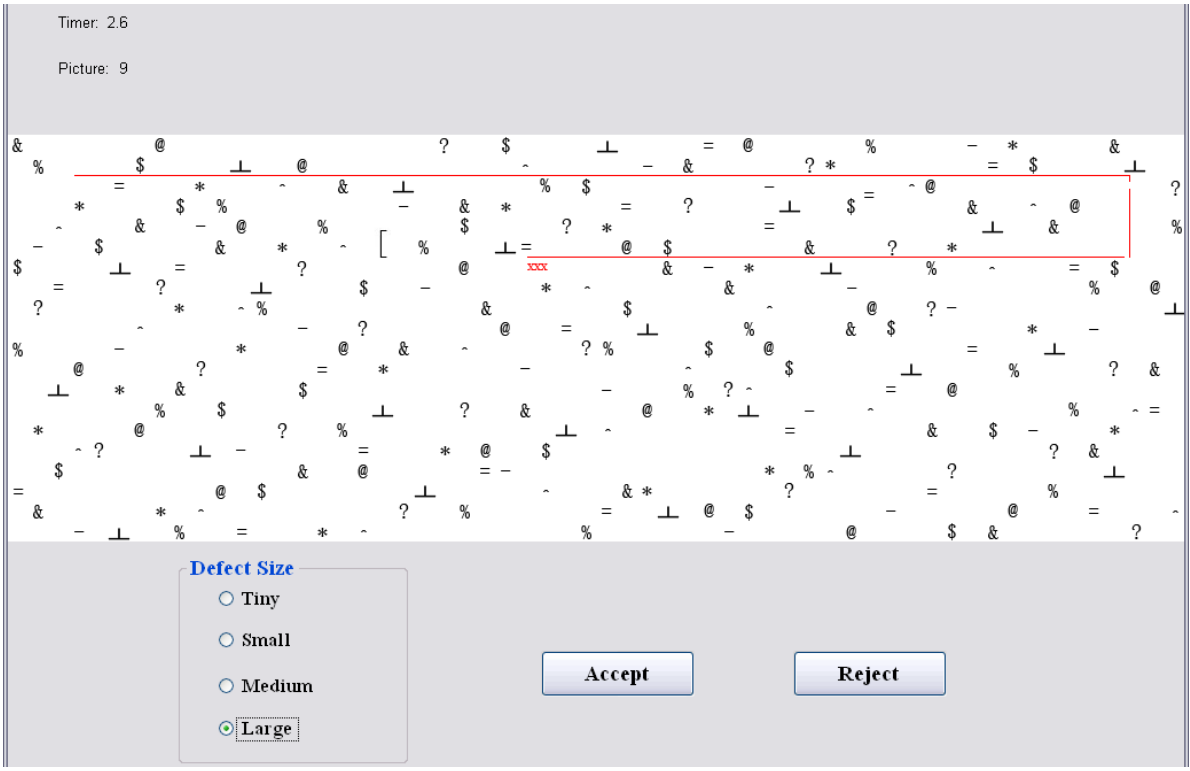

Figure 7. The hybrid pattern.

Results and Discussion

Response time. ANOVA was used for analyzing two time measures, stopping time and search time. Noted that time measures might not be critical variables for the hybrid condition since systematic pacing was applied. For stopping time, there were no significant differences between four cognitive styles in the static ($F(3, 67) = 0.39$, $p = 0.7601 > 0.05$) and hybrid ($F(3, 67) = 2.34$, $p = 0.0811 > 0.05$) conditions. The effects of size and cognitive style on search time were found in both conditions summarized in Table 3. Size × style interaction was not found.

TABLE 3: Size and cognitive style effects on search time in the static and hybrid conditions (ANOVA)

Effect	Static	Hybrid
Cognitive style	$F(3, 277) = 3.45, p = 0.017 < 0.05$	$F(3, 278) = 6.91, p = 0.0002 < 0.05$
Size	$F(3, 277) = 6.13, p = 0.0005 < 0.05$	$F(3, 278) = 14.88, p < 0.0001$

In the static condition, results of means comparisons of search time between four cognitive styles using Scheffe's test showed significant differences at the 0.1 level only between reflectives and impulsives. There were no significant differences between other pairs of groups. Noted that the p-value of the means comparison between reflectives and slow-inaccurates was 1.000 and between fast-accurates and impulsives was 0.931. The relationship between size and search time for different cognitive styles is illustrated in Figure 8. The grouping phenomenon was found that reflectives and slow-inaccurates could be considered as a group, whereas fast-accurates and impulsives were similar in having shorter search time. The grouping differentiated along the MFFT time dimension which was different from the grouping found in the basic condition.

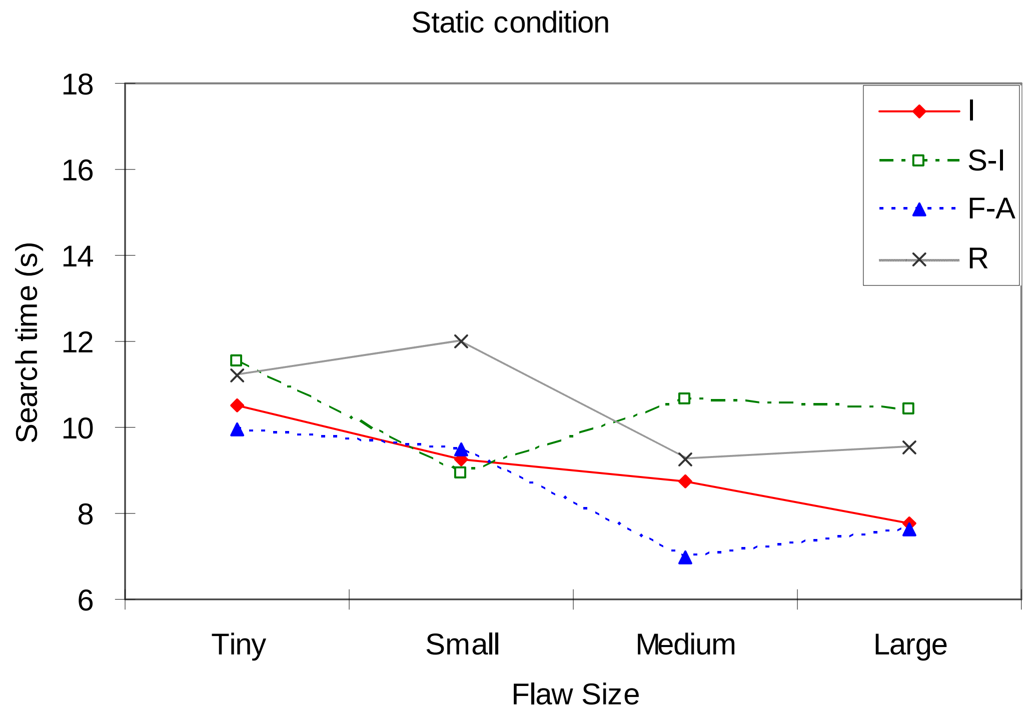

Figure 8. The relationships between size and search time for different cognitive styles in the static condition.

In the hybrid condition, results of means comparisons of search time between four cognitive styles using Scheffe's test showed significant differences at the 0.05 level between: fast-accurates and impulsives, fast-accurates and reflectives, fast-accurates and slow-inaccurates. There were no significant differences between: impulsives and reflectives, impulsives and slow-inaccurates, and reflectives and slow-inaccurates. Figure 9 illustrates the relationship between size and search time for different cognitive styles. The fast-accurates were significantly different from other three cognitive styles in the hybrid condition, i.e., were superior to others.

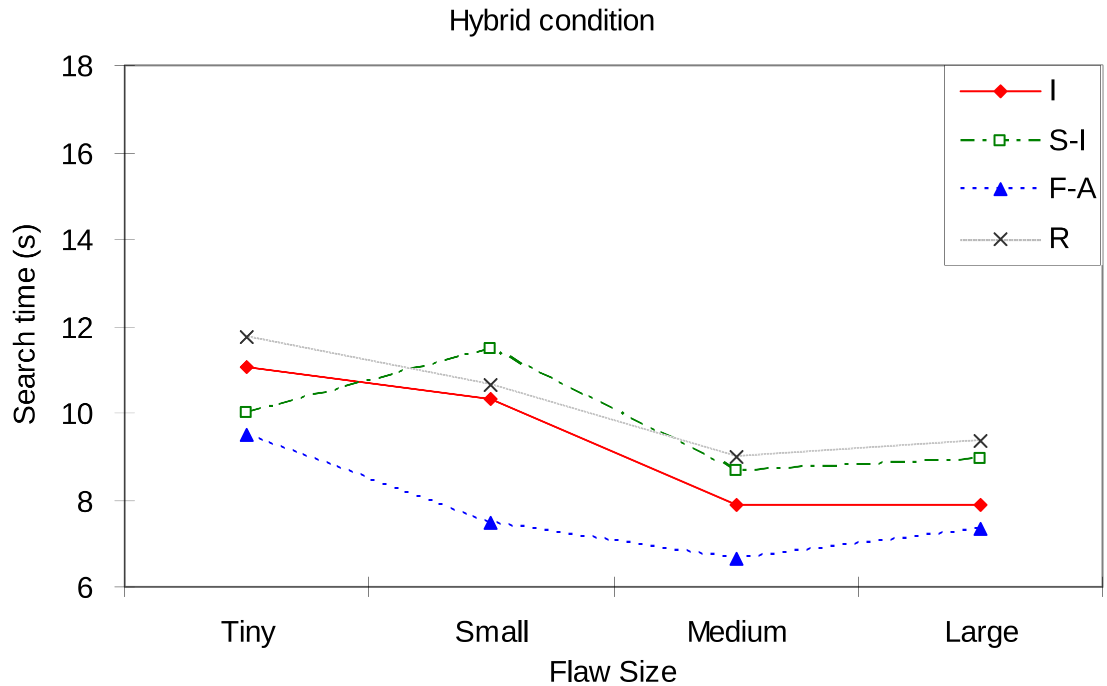

Figure 9. The relationships between size and search time for different cognitive styles in the hybrid condition.

Accuracy. The results of chi-square goodness-of-fit test only showed an evidence of size effect on the reflectives ($\chi^2 = 6.35$, $p < 0.1$) for search success in the static condition. Figures 10a to 11b illustrate the probabilities of search success and correct size judgment across four sizes among four cognitive styles in static and hybrid conditions. Generally speaking, it was easier to make the tiny size judgment. The fast-accurates were superior to the others, i.e., they searched faster and made few errors. There was no statistic evidence to have the grouping phenomenon. However, according to Figure 10b (for small, medium, and large target) and 11b (for small target), the descriptive ranking was shown as fast-accurates, slow-inaccurates, reflectives, and impulsives (from performing better to worse). It could be related to the grouping found for search time in the basic condition. Furthermore, the reflectives would become the worst regarding judging small, medium, and large targets, although they were likely to be faster and detect more targets. Regarding the decision making about the size, very few decision errors would be made once the targets were detected and judged correctly.

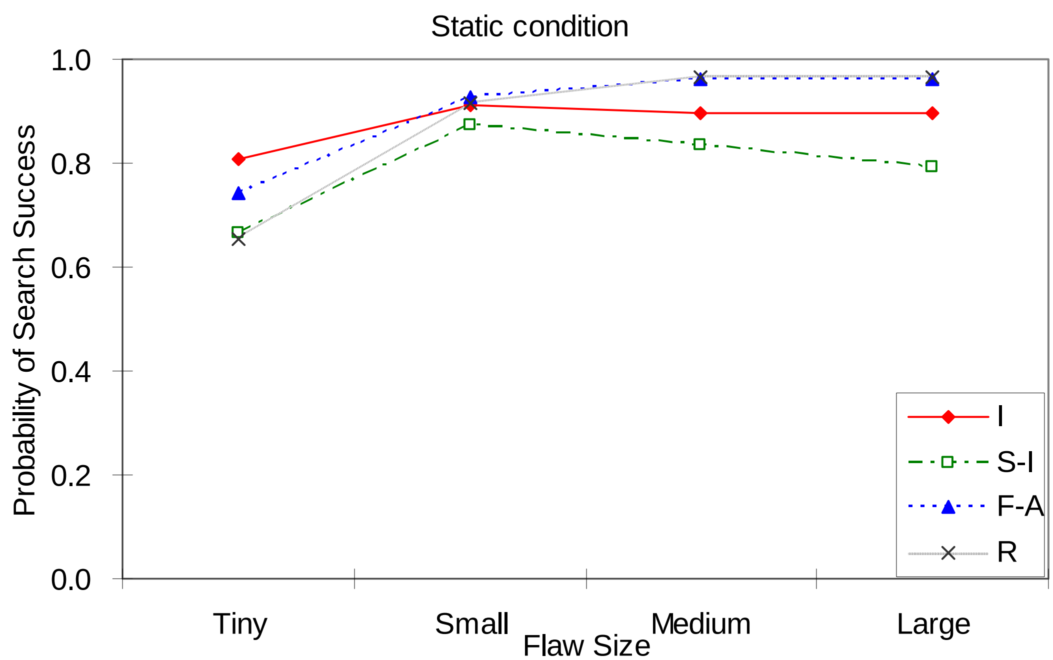

Figure 10a. The relationships between size and search error for different cognitive styles in the static condition.

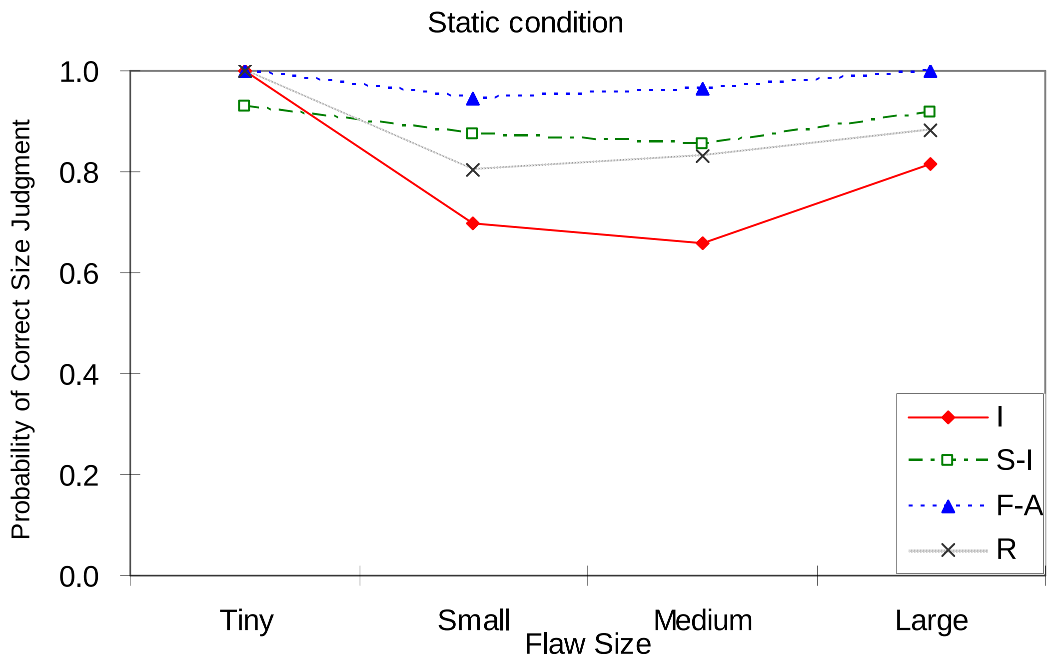

Figure 10b. The relationships between size and size-judgment error for different cognitive styles in the static condition.

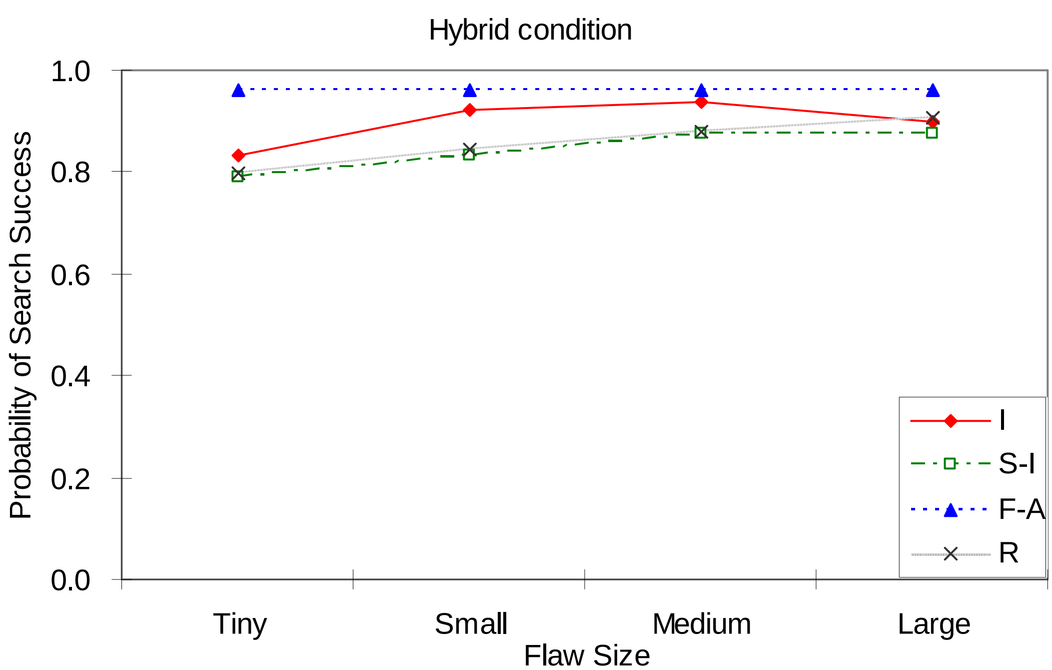

Figure 11a. The relationships between size and search error for different cognitive styles in the hybrid condition.

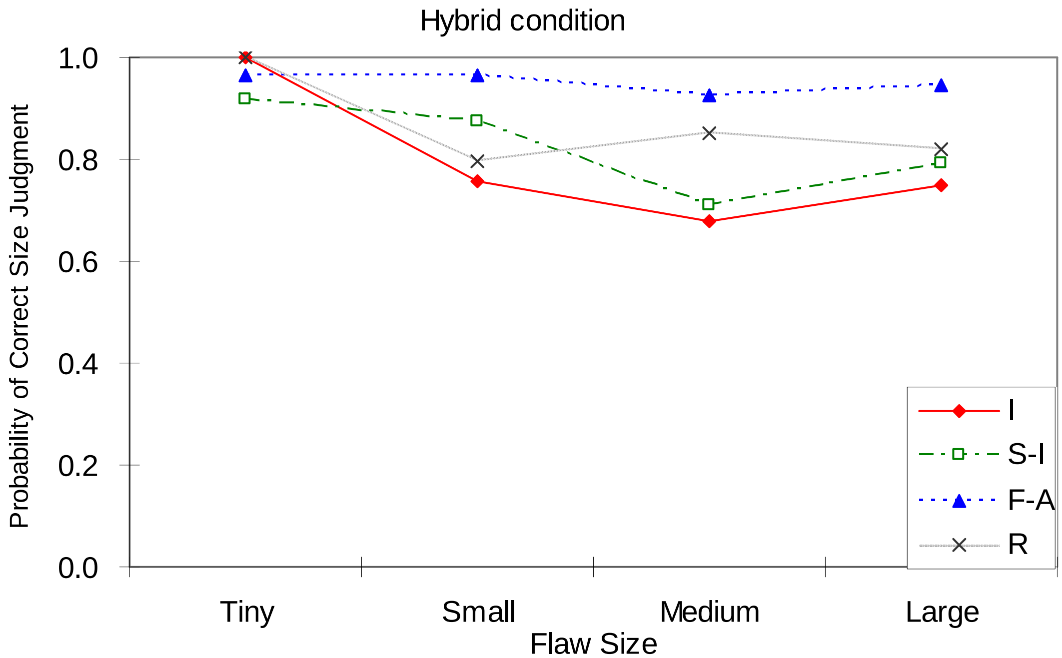

Figure 11b. The relationships between size and size-judgment error for different cognitive styles in the hybrid condition.

Pacing effect. Regardless of the cognitive styles, there was no distinction between the static and hybrid condition as analyzing inspection performance by using t-tests. To study the pacing effect on inspection performance of different cognitive styles, several t-tests were conducted for comparisons between the static and the hybrid condition. Results showed fewer search errors were made by the fast-accurates in the hybrid condition and there was a significant difference of search success in between the static and the hybrid condition ($p < 0.05$). Thus, pacing had a positive impact on the fast-accurates for detecting targets.

GENERAL DISCUSSION

From the experiment results, the effectiveness of the MFFT was tested in various task displays. The relationship between the pacing and cognitive style was explored as well since it was not investigated in previous studies. Generally, the fast-accurates are superior to the other three cognitive styles in all conditions, i.e., fastest and most accurate. Smaller targets (tiny and small) are found more slowly than bigger targets and size judgment for tiny targets is relatively easier to make.

As compared with Schwabish and Drury's study (1984), the similar trends across different target sizes are found in the basic condition for search time, the probability of search success, and the probability of correct size judgment. Although they have presented that there is a grouping effect based on the accuracy dimension, it is not evident in this study. The grouping for search time showed in experiment 1 is differentiated along neither the MFFT time dimension nor the accuracy dimension. It is believed that the age range of participants may have some effects (Salkind and Nelson, 1980) and the familiarity with the task interface is perhaps another factor. It should be noted that the classification via the MFFT is based on the population selected to participate in the experiment. In this study, the median total number of errors is 7 and the median average time to first response is 15.055 seconds, while, in Schwabish and Drury's study, a median error of 9 and a median average time to first response of 43 seconds are used. Nevertheless, in this study, other grouping phenomenon is found on search time in the basic condition: impulsives and reflectives, fast-accurates and slow-inaccurates. It is unusual that the slow-inaccurates have shorter search time, whereas the impulsives are much slower for looking for a character target. Size effects are found that, for the impulsives and the reflectives, they have more difficulties to make correct size judgment as the size is larger.

Regarding the effectiveness of the MFFT when feedforward information is given (i.e., static and hybrid conditions), a grouping for search time differentiated along the MFFT time dimension is found in the static condition. It is different from the grouping in the basic condition of this study and in Schwabish and Drury's study. Moreover, for search time in the hybrid condition, there is no grouping effect but fast-accuarates significantly spend shorter time to search for the target. The size effect is not evident except for the reflectives detecting targets in the static condition. As the target gets larger, the reflectives will have higher probability of search success.

Previous studies have indicated there is no significant difference between static and hybrid conditions for finding the target character (e.g., Nickles, Sacrez, and Gramopadhye, 1998; Nickles III, Melloy, and Gramopadhye, 2003). However, Nalanagula, Greenstein, and Gramopadhye (2006) have indicated that the hybrid display will be more helpful than the static in the printed circuit board experiment. It may infer that for less complex tasks, either static or hybrid display is recommended, whereas for more complicated tasks, the hybrid display will be more effective.

There are many studies where the pacing effect on the accuracy of inspection tasks have been investigated (e.g., Drury, 1994; Koenig, Gramopadhye, and Melloy, 2002; Tetteh et al., 2008). However, one of our hypotheses is that the pacing may have different impacts on different cognitive styles. From the results of experiment 2, it is evident that the fast-accurates have better performance about searching for a target if systematic pacing is applied.

Overall, the hybrid display seems to be more effective than the static display for the fast-accurates since the accuracy is not degraded due to the systematic pacing. This speculation should be further investigated in future studies.

In summary, the MFFT is an effective selection test for inspector classification for all conditions since the fast-accurates are superior to other cognitive styles. The grouping phenomenon should be further investigated whether there is a rule of differentiation. Although there is no significant preference for the types of aid (static or hybrid) in some kinds of task, the hybrid display may be better for the fast-accurates. It can be concluded that the fast-accurates are more robust. As a result, one can use the MFFT to classify inspectors and to predict their inspection performance even as different types of aid are applied in the tasks.

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