

# THE EFFECT OF SYSTEMATIC INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) TRAINING PROGRAMME FOR PEOPLE WITH INTELLECTUAL DISABILITIES

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## Introduction

Rapid development in information and communication technology (ICT) has made computers more user-friendly and convenient than in the past; it became significantly important in our daily lives. Hong Kong was ranked fifth in the world for household access to the Internet in 2001 (The Government of Hong Kong Special Administrative Region, 2001). This indicated that most people in Hong Kong can

access the Internet. However, some minority groups, such as the elderly and people with disabilities, seemed to have more problems in learning ICT (The Government of Hong Kong Special Administrative Region, 2001). Among the disability groups, people with intellectual disabilities (ID) seemed to be deprived of access to the internet. Reasons for the deprivation could be the public perception that on account of their lack of intellectual abilities they are not able to learn the ICT skills which seem to be quite

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complex and demand cognitive functions (Li-Tsang *et al.*, 2005). In Hong Kong, the use of ICT training for children in school settings was only implemented after 1998. People with ID who had graduated in 1998 from school would thus be deprived of the chances to learn ICT skills (Pearson, 2001). Most of them are currently placed in adult training centers such as sheltered workshops or day activity centers. Very few of these settings could provide ICT training that can enhance their skills in this aspect. In order to be successful in training adults with ID to use ICT, more advanced training techniques, adaptive equipment, training software and experienced tutors are essential.

The Hong Kong Special Administrative Region (HKSAR) has identified that digital divide among the minority groups has become prevalent. A campaign was subsequently launched to enhance ICT involvement among different minority groups such as the elderly and people with disabilities. With the financial support from some charitable organisations, tailor-made training programmes were developed to enhance the ICT skills of people with ID.

The purpose of this study was to evaluate the effectiveness of an ICT training programme for adults with ID. A total of two intensive training sessions (three-hour sessions) with additional exercises/tutorials were incorporated into this training programme. Adults with ID were taught the basic computer components, mouse and keyboard usage, and internet browsing using the Internet Explorer (IE). Among the different computer technology skills, the use of mouse and keyboard are the most basic and common input devices that have to be mastered prior to advancing in ICT skills. Operation skills like single click, double click etc., are essential in the basic operation of the computer, like opening a

file or a game and giving commands to the computer.

Browsing the internet was rated the major activity that people engage in when using the computer (Wong *et al.*, 2003). Therefore, it was also selected as one of the main training themes in this training programme.

## Method

### *Participants*

One hundred five persons with intellectual disabilities were recruited for the study using a convenience sampling method. Persons with mild and moderate ID with no severe behavioural or physical problems were recruited for the study. They were divided into the experimental group (76) and the delayed training group (29) on a voluntary basis. None of the participants reported that they had previous formal training in computer skills. Some reported that they had access to computers only at home or at work, but this was often limited due to their inadequate skills in operation. The experimental group underwent a systematic ICT training while the delayed training group received non-systematic IT training from their organisation. They were given the systematic ICT training after finishing all evaluations of the non-systematic training. Pre- and post-training assessments on ICT skills were carried out using a skill-based checklist. A follow-up assessment was done one month after the training programme to investigate the retention of learned skills. In addition, feedback from participants, parents and caregivers were also collected.

## *The ICT Training Programme*

### **1. Training Sessions**

Two 3-hour sessions of group training in computer application were provided. The size of the training groups ranged from 15 to 20 people depending on the levels of intellectual functioning of the participants.

One training session was scheduled to teach the participants to use the mouse and keyboard. A task-breakdown approach was used to teach the skills involved in the mouse operation and basic typing. The participants were taught the basic computer components (monitor, mouse, keyboard, CPU - central processing unit - and printer), mouse (single click, double click, and dragging) and keyboard usage (pressing keys) and function keys on the keyboard (enter, space bar, arrow keys, backspace).

In the second session, participants were taught how to browse the internet using the Internet Explorer. They would learn some basic icons in the tool bars, including back, forward and print, browsing web-pages using the single click and scroll bar, how to type in a website address into the address bar and the use of "My Favourite" to add bookmarks of interesting websites.

### **2. Training Schedule**

The training schedule with additional exercises and tutorials is summarised in Table I.

### **3. Instructors and Tutors**

Instructors and tutors were recruited from the university. They were mainly studying health care related disciplines such as occupational therapy, nursing, social work or special education. Each instructor/tutor would be given a three hour training programme to have a better understanding of the training programme

and to learn various methods and techniques in training people with ID in ICT skills. An instructor was assigned to each training group to ensure the smooth running of the training sessions. Tutors were assigned to provide individual help to each participant where necessary and to observe participants' learning behaviour, give prompting and deal with behavioural problems if necessary. The trainer-trainee ratio for all groups regardless of the size of the group was around 1:3 in each group.

In the training workshops for instructors and tutors, the learning characteristics of people with ID and training skills were presented. They also learnt about the major difficulties encountered by people with intellectual disabilities in the learning of ICT skills.

### **4. Training materials**

The project team has developed three sets of software in Chinese as most commercial software on the market is too difficult for the participants. Moreover, there was a language barrier for the subjects as most software was either in English or in Pinyin (Higgins and Boone, 1996). The development of the software was based on criteria identified in software design for people with special needs (Higgins *et al.*, 2000). The content of the programme was designed based on task analysis of skills required in using mouse and keyboard. The software was easy to operate, interesting and written in a language appropriate for the participants. It was supplemented with reinforcing sound feedback, was simple and attractive in layout to enhance the user's interest in learning. Three sets of software were produced: Mouse Tutorial, Balloon Game and Typing Guide. The Mouse Tutorial was designed to train participants to use the mouse (single click, double click and dragging). Balloon Game

**TABLE I**  
**The ICT Training Programme**

**First Session**

<b>Duration (minutes)</b>	<b>Content</b>
5	<ul style="list-style-type: none"> <li>• Introduction to the course and tutors' self-introduction</li> <li>• Announce rules in the classroom</li> <li>• Announce rules for using computer</li> </ul>
30	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
10	<ul style="list-style-type: none"> <li>• Introduction to the computer hardware</li> </ul>
15	<ul style="list-style-type: none"> <li>• Introduction to the components of a mouse</li> <li>• Introduction and demonstration of the use of a mouse</li> <li>• Practicing time</li> </ul>
20	<ul style="list-style-type: none"> <li>• Demonstration of computer games (1) and (2)</li> <li>• Play games (1) and (2) to practice the use of the mouse</li> </ul>
10	<ul style="list-style-type: none"> <li>• Break</li> </ul>
25	<ul style="list-style-type: none"> <li>• Introduction to the components of the keyboard</li> <li>• Introduction and demonstration of the use of the keyboard</li> <li>• Practicing time</li> </ul>
20	<ul style="list-style-type: none"> <li>• Demonstration of computer games (2) and (3)</li> <li>• Play games (2) and (3) to practice the use of keyboard</li> </ul>
10	<ul style="list-style-type: none"> <li>• Break</li> </ul>
30	<ul style="list-style-type: none"> <li>• Introduction and demonstration of the software "Paint Brush' to draw a picture</li> <li>• Practicing time</li> </ul>
5	<ul style="list-style-type: none"> <li>• Printing out the picture</li> </ul>

**Second Session**

<b>Duration (minutes)</b>	<b>Content</b>
10	<ul style="list-style-type: none"> <li>• Revision on topics covered in the first session</li> </ul>
25	<ul style="list-style-type: none"> <li>• Introduction to the concept and use of internet</li> <li>• Introduction to the concept of internet browser</li> <li>• Introduction to the layout of internet browser</li> <li>• Introduction and demonstration of the application of browser (1)</li> </ul>
15	<ul style="list-style-type: none"> <li>• Break</li> </ul>
50	<ul style="list-style-type: none"> <li>• Introduction and demonstration of the application of browser (2)</li> <li>• Practicing time</li> </ul>
15	<ul style="list-style-type: none"> <li>• Break</li> </ul>
15	<ul style="list-style-type: none"> <li>• Introduction and demonstration of the use of a bookmark</li> </ul>
20	<ul style="list-style-type: none"> <li>• Practicing time</li> </ul>
30	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>

Note: game (1) refers to the Mouse Tutorial game, game (2) refers to the Balloon Game and game (3) refers to the Typing Guide game

was designed to train the user to single click and type alphabets. The third software, Typing Guide, was developed to train typing skills with four levels of difficulties, from typing one alphabet at a time, typing words to sentences and paragraphs (FIGURE 1). In all three of the software, errors were allowed. There was no time limit set in giving responses, except the Ballon games.

### *Programme for the delayed training group*

Participants who were assigned to the delayed training group were given an equal number of training hours at their working or training center, supervised by the staff there. The training centers of participants in the delayed training group were not

given any information relating to the ICT training content provided by this research study. Therefore, the environment, trainers, training materials and content were different from the systematic ICT training provided for the experimental group. For ethical considerations, the delayed training group was given the systematic training after the whole evaluation was completed. During this period, participants were not given any formal training in computer skills at home or at their workplace. This was further reconfirmed by their caregivers and family members.

### *Assessment Protocol*

A computer-skills checklist was developed to evaluate the effectiveness of the training programme based on the task

FIGURE 1



#### **Training Software I: Mouse Tutorial**

Description: This software is colour-attractive and easy to operate and is used for training the participants to use the mouse. It has teaching modules: **Mouse Click, Mouse Moving, Move and Single Click, Double Click, Drag and Drop**. Instructions are given for the user to follow the module. Participants can practice any modules again at the end of the programme.

#### **Training Software II: Balloon Game**

Description: This is a fun game for the users to practice single click and pressing letters on the keyboard. It can help to increase the interest of the users.

#### **Training Software III: Typing Guide**

Description: This software aims to improve users' typing skills and form a bridge between keyboard games and common word processing software. It has four training modes: **Character mode, Word mode, Sentence mode and Paragraph mode**.

analysis of computer operation. Existing standardised tools such as the computer literacy assessments, the test of Mouse Proficiency (TOMP) (Lane and Ziviani, 2003) and assessment of Computer Task Performance (Dumont *et al.*, 2002) were found not suitable for assessing people with ID. The two tests mentioned above were adopted for children with physical disabilities where the main obstacle to use ICT skills were motor skills. As for people with ID, the main barrier is the deficiency of cognitive abilities for analysing the tasks and following the procedures rather than the motor abilities. Therefore, in our computer-skills checklist, we have divided the skills of computer operation into various tasks so that the performance could be measured precisely.

The main tasks identified were use of the mouse and keyboard, and internet browsing using IE. There are altogether

eight tasks on using the mouse and keyboard. Each participant was assessed on how well he/she could edit a pre-set Microsoft Word document using the mouse and the keyboard to perform single click, double click, dragging, and pressing the specified keys on the keyboard. There are nine tasks on internet browsing (Table II). Each participant was asked to use the web browser - Internet Explorer to browse a specified webpage, a bookmark and retrieve a bookmark. The items were then reviewed by 5 experienced occupational therapists to ensure satisfactory content validity. Three of them have other professional qualifications, namely psychologist, teacher and social worker. The professionals reviewed the checklist and arrived at the consensus that the essential basic computer skills were to be assessed with some minor adjustments.

Participants were given standardised

**TABLE II**  
**The Computer Skills checklist**

ICT Skills Assessed	Task Description	Score	
		0	1
Use of Mouse and keyboard	Double Click		
	Use of arrow keys to move the cursor		
	Put the cursor in the specified position		
	Typing the word "HAPPY"		
	Deleting two words		
	Use of spacebar to insert two blank spaces		
	Use of ENTER key to insert a blank line		
	Dragging (moving an icon on the desktop)		
Internet browsing	Opening the IE browser		
	Retrieving a bookmark		
	Using the scroll bar		
	Browsing by single click		
	Use of the BACK key		
	Typing webpage address in the correct position		
	Pressing ENTER key after typing		
	Adding a bookmark		
	Close the browser		

instructions to perform the designated computer tasks and were assessed on their competence to complete the tasks. One mark was given to those who could successfully perform the specified behavioural descriptions and zero mark to those who failed to complete the task within 30 seconds. The overall score was calculated by summation of the marks obtained from each task. The assessors were university students who had attended a training session for conducting the assessment. Those who have assessed the participants were not involved in the training programme as tutors. The inter-rater reliability of the checklist was found to be high with inter-class correlation 0.98. The same assessments were conducted for the experimental group pre-, post- training and at the one month follow-up meeting with the participants.

## Results

### *Demographic characteristics*

There were 43 (56.6%) male and 33 (43.4%) female participants in the experimental group with a mean age of 23.16 years ( $SD=10.17$ ), age ranged from 10 to 49 years. In the delayed training group there were 17 (58.6%) male, and 12 (41.4%) female participants with a mean age of 28.28 years ( $SD=9.35$ ), age ranged from 8 to 56 years. Sixty three (82.9%) participants in the experimental group were reported to have mild ID while 13 (17.1%) were reported to have moderate ID. In the delayed training group, 13 (44.8%) had mild ID and 16 (55.2%) moderate ID.

**TABLE III**  
**Demographic characteristics of the sample group (n = 105)**

Characteristic		Number (Percentage)
Experimental Group (n = 76)	Gender	
	Male	43 (56.6%)
	Female	33 (43.4%)
	Mean Age	
	Male	22.53 (SD = 10.08)
	Female	23.97 (SD = 10.39)
Delayed Training Group (n = 29)	Gender	
	Male	17 (58.6%)
	Female	12 (41.4%)
	Mean Age	
	Male	23.53 (SD = 5.19)
	Female	35.00 (SD = 9.95)
Intellectual Functioning		
	Mild ID	63 (82.9%)
	Moderate ID	13 (17.1%)
Intellectual Functioning		
	Mild ID	13 (44.8%)
	Moderate ID	16 (55.2%)

### Pre- and Post- Assessments

In the pre-and post-assessment of the experimental group, the mean score for the tasks of use of mouse and keyboard was 1.89 out of 8 (SD=1.86) before training and 4.09 (SD=2.53) after training. For the tasks of internet browsing, the mean score before training was 2.42 (SD=2.45) and after training was 5.49 (SD=3.18) with 9 as full score. The overall assessment scores before and after training were 4.32 (SD=3.94) and 9.58 (SD=5.24) out of 17 items respectively. The improvement in scoring represented the increase in the number of tasks participants could manage without assistance. Significant differences were shown in the tasks of use of mouse and keyboard,  $t(75) = 9.30$ ,  $p < 0.000$ , the tasks of internet browsing,  $t(75) = 11.13$ ,  $p < 0.000$  and the overall score  $t(75) = 12.21$ ,  $p < 0.000$ . These results indicate that participants obtained significantly higher scores on the computer-skills checklist after training, showing that the ICT group training programme in-

creased the participants' level of computer competence (TABLE IV). More than 23% of participants ( $n=18$ ) were able to master the skills for using of mouse and keyboard with high scores (7 or 8 out of 8) in the mouse and keyboard tasks.

For the delayed training group, the mean score for the tasks of using mouse and keyboard was 1.41 (SD=2.47) before training and 1.72 (SD=2.64) after training. For the tasks of internet browsing, the mean score before training was 1.79 (SD=2.81) and after training 1.66 (SD=2.83), the full score was 9. The overall mean assessment score before and after training was 3.21 (SD=5.19) and 3.41 (SD=5.42) respectively. No significant difference was shown on tasks of using mouse and keyboard,  $t(28) = 1.51$ ,  $p = 0.142$ , the tasks of internet browsing,  $t(28) = 1.00$ ,  $p = 0.326$  and the overall score,  $t(28) = 0.90$ ,  $p = 0.375$ . These results indicate that participants obtained no significant difference in scores on the computer-skills.

**TABLE IV**  
**Mean Scores (n = 105) in the computer-skills checklist before and after training**

Main Tasks		Before Training Mean Score (SD)	After Training Mean Score (SD)	t-value	p
Use of mouse and keyboard	Experimental Group	1.89 (1.86)	4.09 (2.53)	9.30	.000
	Delayed Training Group	1.41 (2.47)	1.72 (2.64)	1.51	.142
Internet Browsing	Experimental Group	2.42 (2.45)	5.49 (3.18)	11.13	.000
	Delayed Training Group	1.79 (2.81)	1.66 (2.38)	1.00	.326
Total Score	Experimental Group	4.32 (3.94)	9.58 (5.24)	12.21	.000
	Delayed Training Group	3.21 (5.19)	3.41 (5.42)	.90	.375

df of Experimental group = 75

df of Delayed Training group = 28

Level of significance is set to be  $p = 0.05$

Results from the two-way repeated-measure ANOVA and t-tests indicated no significant difference between the experimental and delayed training group ( $p > 0.05$ ) before training, but a significant difference was found after the systematic ICT training programme in the tasks of using of mouse and keyboard, internet browsing and total score. Post-hoc comparisons between the 2 groups of participants indicated significant differences in use of mouse and keyboard [ $t(104) = 4.06$ ,

$p < 0.000$ ] and internet browsing [ $t(104) = 3.75$ ,  $p < 0.000$ ], and the total score [ $t(104) = 5.35$ ,  $p < 0.000$ ].

### Follow-up Assessment

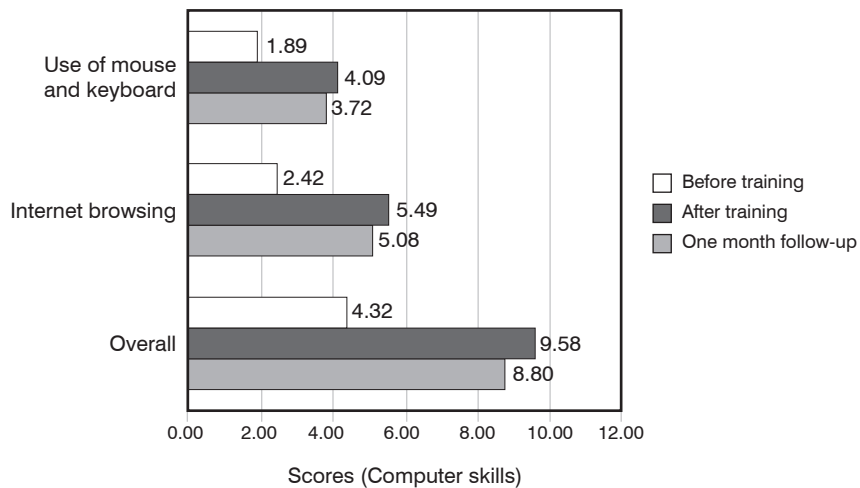
Follow-up assessments were conducted on all participants in the experimental group one month after completion of the training in order to measure the retention

**TABLE V**  
Results of repeated ANOVA comparing pre- and post-assessment results of experimental group and delayed training group

ICT Skills assessed		F <sup>a</sup>	p
Use of mouse and keyboard	Between group difference	9.43	.000
	Within group difference	38.60	.000
Internet browsing	Between group difference	8.61	.000
	Within group difference	32.66	.000
Total score	Between group difference	13.47	.000
	Within group difference	58.73	.000

<sup>a</sup>df = 1,103

**FIGURE 2**  
Mean scores of the subjects before training, after training, and at one month follow-up



of learnt skills. The mean score of using mouse and keyboard was 3.72 (SD=2.68), internet browsing was 5.08 (SD=3.09) and mean for total score was 8.80 (SD=5.34). The scores showed that the participants lost some of the learnt skills as the scores were lower than those obtained after training (FIGURE 2). Yet, their competence was still higher than their initial level before training.

Significant effects were shown in the one-way repeated measure ANOVA for the use of mouse and keyboard, [F (74) =42.99,  $p < 0.000$ ], and internet browsing, [F (74) =67.27,  $p < 0.000$ ], as well as the total score, [F (74) =77.45,  $p < 0.000$ ]; t-tests were conducted to reveal the mean differences between levels of computer competence immediately after training and at the one month follow-up period.

No significant difference was found in the tasks of using mouse and keyboard,  $t(75) = 1.49$ ,  $p > 0.05$  and internet browsing,  $t(75) = 1.33$ ,  $p > 0.05$  as well as the overall score,  $t(75) = 1.64$ ,  $p > 0.05$ . These results seemingly indicate that participants were able to retain what they have learnt from the ICT training programme. The ICT training programme successfully enhanced the basic computer competence of the participants though the level of achievements had slightly deteriorated.

Further examination of scores indicated that most participants lost the skills of using the "Backspace" key in the use of mouse and keyboard. The percentage of participants who could successfully carry out this task dropped from 56.6% to 40.8%. In the tasks of internet browsing, "press Enter to go to another website" dropped from 52% to 36.8% and using "My favourite to add bookmark" dropped from 43.4% to 36.8%. They were the two skills with significant decrease in success rate.

### *Training effects for participants with mild ID and moderate ID*

From the results, the majority of participants in the experimental group were found to have a mild ID ( $n = 63$ ), another 16 participants had a moderate ID. In the experimental group, participants with mild ID were found to have gained a greater improvement in computer competence after training. For the group with mild ID, the total score increased from 4.68 (SD = 3.91) to 10.14 (SD = 4.94) while that of the group with moderate ID increased from 2.54 (SD = 3.69) to 6.85 (SD = 5.96). Surprisingly, the group with moderate ID had a better retention than the group with mild ID. The total score for the group with moderate ID in the one month follow-up assessment was 7.15 (SD = 6.01) which indicated an increase of mean difference of 0.3. The total score of the group with mild ID was 9.14 (SD = 5.18) a mean score difference equal to 1. In the delayed training group, participants with mild ID had a slightly greater increase in the total score after unsystematic training (mean difference = 0.54) over participants with moderate ID (mean difference = 0.06) in the post assessment.

### *Feedback from participants, caregivers and parents*

Favorable feedback was received from participants, their caregivers and parents. Participants mostly enjoyed the atmosphere of group learning, also practicing the skills using the specially designed software with enthusiasm. Parents and caregivers indicated that the training pace was appropriate and sufficient assistance was given to the participants during the

training sessions. They were particularly impressed by the specially designed training software which aroused participants' interest to use the computer, thus helping them to learn the IT skills using the step-by-step training approach.

## Discussion

From this study, encouraging results reflected the effectiveness of the systematic ICT training programme for persons with ID and their retention of skills. Some factors possibly related to the success in ICT skills acquisition of people with ID are postulated as followings.

### *Elements of effective training*

The main features of the present ICT training programme are that the trainer-trainee ratio is low and that specially designed curriculum and training software are used. A low trainer-trainee ratio might be important to ensure effective learning as people with ID were found to have a low attention span (Huguenin, 1997) and a low ability in following instructions (Hughson and Brown, 1983). Thus, the tutors would ensure that trainees follow the class instruction and practice the taught skills as instructed and increase their engagement in the instructed activities. Feedback could be given to the participants on their performance. Engagement time and performance feedback are identified as important factors in effective teaching conducted in groups (Hendrickson and Frank, 1993)

The specially designed curriculum might be another important feature that contributed to the training success. The

curriculum used in the present study was designed to break down the complex ICT skills into simple steps to suit the needs of the participants. Past studies indicated that persons with ID could acquire different skills through step-by-step training (Hartwick and Yuen, 1996; Mattie, 2001; McCarl *et al.*, 1991).

The software used was found to be culturally relevant, with good visual/auditory feedback and appropriate to the trainees' level of understanding. The training software, unlike the commercially available training software, is more user-friendly and the language is that commonly used by the participants. Computer software in training daily skills was found effective in teaching because it provides sufficient and enjoyable stimulation and a gradual increase in task difficulties (Hawkrigde and Vincent, 1992). Interactive software also reinforces active involvement in learning and users could gain a sense of control over the learning process (Pantelidis, 1993). Though a number of software programmes have been developed for persons with ID for training of daily living skills, such as problem solving skills (Mastropieri, 1997) and time management skills (Davis *et al.*, 2002), yet, only few software programmes have been developed for training ICT skills and enhancing computer competence for local people with ID.

### *Skills retention*

The follow-up study gave us positive indications that participants could retain some of the trained skills after a one month period. Maintenance of learnt skills has been a challenge to many practitioners in the field. The findings are encouraging in the endeavour to develop more advanced ICT training for persons with ID. It is sug-

gested that follow-up training should be given to enhance the learning through home training or a new programme.

Further examination of the scores indicated that skills which were comparatively difficult would be lost after a one month period. The use of "Backspace" in editing, "press Enter to go to another website" and the use of "My Favorite to add bookmark" were found to be the lost skills for most participants. These skills were also the ones with the lowest success rate before training and were hardest to acquire through training. From the results of the study, it has brought to our attention that people with ID might need more task modifications and reinforcements to learn more complex tasks such as browsing the internet and tasks that require multiple steps of commands. The commercial software designer may have to consider modifying the steps involved in the operation to make it more user-friendly for people with ID. In this way, the digital divide could be narrowed down and people with ID could also enjoy the IT platform for entertainment, leisure, information retrieval and even for productivity.

From this study, persons with ID were seen to be able to master and retain some basic computer skills such as clicking, dragging or opening IE icon. However, more complex tasks in computer operations might require regular training and practice in order to retain the skills. Due to resource limitation, this present project could only offer short term training courses for people with ID. With the positive results achieved, it could be extended to a more long-term, systematic training for more advanced computer skills. In this way, people with ID can be strengthened to consolidate the learnt skills, and to advance their skills with more complex software so that they could better utilise the IT platform.

### *Intellectual abilities on ICT learning*

The results of the study indicated that there was no gender difference in computer literacy. The outcomes showed that both males and females with ID could learn basic computer skills with training. Yet, it became evident that the level of intellectual functioning seemed to be the main factor affecting the learning of ICT skills. Participants with mild ID benefited more from the systematic ICT training in the use of mouse and keyboard and internet browsing. It seems that those who have higher intellectual functioning could further learn more advanced ICT skills while those with lower intellectual functioning should have more training hours for the basic ICT skills.

Persons with mild ID and moderate ID could retain equally well the learnt ICT skills. This was apparent from the one month follow-up evaluation. People with moderate ID may be able to acquire the basic skills that they learnt in the training sessions while people with mild ID could sustain more learnt ICT skills. Thus, both groups could retain the learnt skills according to their levels of understanding.

The present ICT training programme could be further developed in a number of aspects. First, a training programme for more advanced ICT skills, such as using Microsoft Office to perform editing or data management, could be tailor-made for people with mild ID as they were shown to be able to learn more complex skills. On the other hand, basic ICT training could be provided for people with moderate ID to promote their leisure scope and enhance communication with other people. Second, other easy-to-operate training software could be developed to reinforce practice of skills in daily life. Third, more train-the-trainer workshops could be conducted so that professionals in the field are

more aware of the need of learning ICT and thus offer more training opportunities and reduce digital divide. Lastly, the involvement of caregivers is important as they could carry out home-based training and assist the trainees to learn and practice. With further reinforcement of training at home and at work, people with ID could retain those learnt ICT skills. At the same time, they would be more prepared to learn more advanced skills once they have mastered the basic skills. In addition, caregivers should also be strengthened in ICT skills so that they might serve as trainer of people with ID. In this way, people with ID will further advance their ICT skills so that they can fully participate in the digital world. In order to prepare them to function independently in the future world, ICT skills are the most essential survival skills that they have to acquire.

### *Limitations of the Study*

To be cost-effective and with resource constraints, ICT training was provided in groups of relatively large size. Individual training may be an alternative and further study may compare the effectiveness of the two training forms.

As the number of people with ID who joined the ICT training programme was very large, it was difficult to have a homogeneous group for recruiting to join the programme evaluation study. Therefore, people with varied intellectual functioning, age and/or prior experience in using computer may have joined the experimental group or the delayed training group which made comparison between and within groups difficult. Another methodological flaw was the limited matching which was done between the experimental group and the control group.

The computer competence was assessed by a self-developed checklist. Only limited psychometric properties of the test were established because of limited resources. Further validation should be carried out on the checklist.

The participants included in our study were those with limited computer skills and exposures; no previous training in ICT skills was reported. When they were at school age, computer training was not as popular and it was not part of the formal school curriculum. Therefore, they were deprived of proper training in ICT skills until 1998 when computer training was formalised in special school settings. When they graduated from the school settings, they were often put into different work placements settings such as sheltered workshops or day activity center. These centers were more focused on vocational training. The ICT training programme was only introduced in recent years when the Government was – and still is - pushing hard to break the digital divide in society. It is therefore not easy to compare the effect of prior experience of this group of adults in using the computer for ICT leaning

### **Conclusion**

This is an initial endeavor to provide a systematic, structured, group ICT training for people with intellectual disabilities. The training programme was found to be effective in increasing the level of computer literacy and competence of persons with intellectual disabilities. The present study also demonstrated the retention of learnt ICT skills of people with ID. The improvements were seen in some of the basic computer operation tasks such as single clicks and dragging, of using the mouse and typing English words and numbers

using backspace, enter, direction keys and spacebar key. Some skills which require more steps and complicated procedures (e.g. double click, using “my favorite” function in internet browsing) may need further training and reinforcements. Special consideration or modification in designing commercial software should be noted for a better utilisation of ICT skills.

From this successful experience in carrying out the training programme, the essential components of an ICT training programme for people with ID should be structured and accompanied with specially designed software, low trainer-trainee ratio and home practice. These are critical factors for participants to obtain the relevant computer skills. With appropriate training, people with ID should be able to master ICT skills, as shown in the present study.

While the findings in this study suggested the need for a low trainer-trainee ratio in ICT training, this is hardly ensured during the current trend in financial and resources cuts. Service providers should consider involving caregivers in the training programme and reinforce the training by using more home training programmes and interactive software programmes. Caregivers should also be given opportunities to receive more advanced training of ICT skills so that they could equip their skills and proficiency for teaching their children or service users by using appropriate methods.

The duration of this ICT training programme was relatively short, the group size was comparatively large, and participants were from different backgrounds and with varied intellectual functioning. However, despite all these confounding factors, they managed to retain the basic ICT skills. These encouraging results should make rehabilitation professionals aware that with an intensive, tailored

training programme, people with ID may acquire ICT skills, and apply those skills at work, daily life activities and leisure.

## Summary

*Purpose:* The present study was to evaluate the effectiveness of an Information and Communication Technology (ICT) training programme for people with Intellectual Disabilities (ID).

*Method:* 105 persons with intellectual disabilities were recruited for the evaluation of the ICT training programme (76 in the experimental and 29 in the delayed training group (control group)). Participants in the experimental group underwent systematic ICT training with a specially designed curriculum and software. The training programme taught about PC components, mouse and keyboard usage and the use of the Internet Explorer (IE). The delayed training group was given equal hours of non-systematic ICT training during the study period, and then was given the systematic ICT training 1 month after the evaluation. All participants were assessed at pre- and post training and at one month follow-up using a computer-skills checklist. Feedback from caregivers and parents were also collected.

*Results:* Two-way repeated measure ANOVA and independent t-tests showed that participants acquired a higher level of computer competence after systematic ICT training and retained the learnt IT skills within one month follow-up period, [F (74) = 77.45,  $p < 0.000$ ].

*Conclusion:* The systematic training programme was effective in increasing the level of computer literacy and competence of persons with intellectual disabilities.

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