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INTRODUCTION

The Assessment of Computer Task Performance (ACPT) is a measurement instrument developed to help therapists conduct activities and make recommendations concerning the access to and use of computers by people with physical impairments. This instrument makes it possible to assess the performance of a computer user who should need assistive devices to compensate for their disability. This assessment can be useful in comparing the efficiency of two different assistive devices, judging the progress made after a training period or comparing the performance of a person with that of the normative group. This instrument measures performance in terms of speed and quality for all the user actions or sequence of actions that result in a computer command, such as being able to type a letter on the keyboard or move the pointer with the mouse in any software where this applies. Certain actions or sequences of actions are more complex, for example, clicking, moving the pointer and clicking again to open a file. The user actions that are assessed in this evaluation were developed through a research project that consulted with experts and directly observed the actions of people using the computer for different purposes, including accounting, secretarial work, games and internet. The fact that the assessment focuses on **user actions** makes it possible to compare the results of testing using all types of software and computer applications in which any kind of mouse or keyboard are used.

The test was first developed in French, then translated and validated in English. It is divided into three parts. In Part I, keyboard, or writing functions are assessed, in Part II, pointer and mouse functions are assessed, and in Part III, the subjective data concerning comfort and practical aspects are collected from the clients who are evaluated with assistive devices. There is both an adult and a child version of the test. In the adult version, Part I contains two preliminary tasks, and seven tasks which are standardized and timed. Part II comprises five preliminary tasks, including several sub-tasks and seven standardized and timed tasks. A first version for children was created in 2000. The adult version served as the basis for the development of this child version. The tasks were adapted to take into account the motor, perceptual and cognitive skills of pre-school and primary school aged children (up to the third grade), or of children with a corresponding level of development. Results of testing indicated that this version had psychometric problems. In addition, since children's performance changes significantly with age, it was not possible to make valid comparisons with the available data in order to judge the child's performance. A new version was then developed and validated. Psychometric properties were improved in this new version. Part I is comprised of six preliminary tasks and five standardized and timed tasks. Part II contains seven preliminary tasks with several sub-tasks and five standardized and timed tasks. It may be administered to children from 5 to 9 years of age. The easiest tasks can be used to evaluate younger children. The adult version can be used for children older than 10 years of age, by selecting the most relevant tasks. Children over 12 years old can be assessed using the entire adult version.

This document contains the following sections: 1) the list of the user actions assessed in the test; 2) the prerequisites needed before administering the test; 3) general instructions; 4) assessment and correction criteria; 5) results interpretation; 6) the required material; 7) a glossary; 8) a sample identification form and, finally, 9) the description of each task on the adult version and the child version of the test, including the standardized method of administration and the data to assist in interpretation. The new version presents norms according to age, allowing the evaluator to make judgements about performance using the computer. Many research projects were conducted in the development of this test. The results of these projects have been published and research reports are available from the principal author.

1. LIST OF ASSESSED USER ACTIONS

There are three categories of actions: those involving keyboard functions, those involving mouse functions and those requiring a combination of both keyboard and mouse functions. The symbols indicated in parentheses correspond to tasks in the test which assess this action or this sequence of actions. The complete list of tasks is presented in the appendix.

1.1 Actions Involving Keyboard Functions:

- press all the keys on the keyboard (PK-1, K-1, K-2, K-7, CPK-1, CK-3)
- hold a key down while pressing another key (right and left side), for example, when writing upper-case letters (double-key task) (PK-2, K-2, K-3, K-4, K-7, CPK-2, CPK-3, CPK-4, CPK-6)
- carry out a triple-key task (PK-2)
- press a key more than once (K-4, CPK-5, CPK-6)
- hold a key down for a precise period of time, for example, when moving the cursor (K-5, K-6, CPK-5, CK-1)

1.2 Actions Involving Pointer and Mouse Functions:

- left-click, i.e. click the left mouse button (PM-1, M-1, CPM-1, CM-1)
- right-click, i.e. click the right mouse button (if applicable) (PM-1, CPM-1)
- double left-click (PM-1, M-4, CPM-1, CM-2)
- hold the mouse button down for a precise period of time (PM-2, M-2, M-3, M-5, M-6, M-7, CPM-4, CPM-5, CPM-6, CM-3, CM-4, CM-5)
- cross the entire screen with the pointer (PM-1, M-1, CPM-1, CM-1, CM-4, CM-5)
- follow a precise path with the pointer (M-1, M-2, M-3, CPM-2, CPM-3, CM-1, CM-2, CM-3, CM-4, CM-5)
- stop the pointer at a precise location (M-1, M-4, M-6, M-7, CM-1, CM-2, CM-3, CM-4, CM-5)
- drag: stop the pointer on an icon or the upper bar of a window, click the mouse button, hold it down and move the icon or window across the entire screen (PM-4, M-2, M-3, M-5, CPM-2, CPM-3, CPM-4, CPM-5, CM-3, CM-4, CM-5)

1.3 Combinations of the Preceding Actions:

- stop the pointer at a precise location and click (PM-4, M-1, CM-1, CM-3, CM-4, CM-5)
- stop the pointer at a precise location and double-click (PM-4, M-4, CPM-7, CM-2)
- drag and drop (release the mouse button) at a precise location (M-2, M-3, M-5, CPM-2, CPM-3, CPM-4, CM-3, CM-4, CM-5)
- point to a precise location, left click, move the pointer over a precise path, stop at a precise location and left click a second time (PM-3, M-1, CPM-6, CM-1)
- bring the pointer to a precise location, left (or right) click, hold the mouse button down while following a precise path and release it at a precise location, for example, when moving to a submenu in a scroll bar, selecting a part of the text in a document or changing the size of a window (this corresponds to the same action as “dragging”, but instead of clicking an icon, click a menu or the edge of a window) (PM-3, K-7-b, M-5, M-6, M-7, CPM-5, CPM-6, CPM-7, CM-3)

- right click, move the pointer over a precise path and click again at a precise location (Windows only) (PM-3, CPM-6)
- commands that combine the mouse and keyboard, such as holding a key down while dragging (PM-5)

2. PREREQUISITES BEFORE ADMINISTERING THE TEST

2.1 Position of the Person Being Assessed

Usually, the person must be seated appropriately on a chair or wheelchair. The work table must be adjusted to a suitable height. The computer screen must be in front of the person and at eye level when the person is in a comfortable position. The feet must rest on a surface.

2.2 Choice of Assistive Devices

One or more trials must be carried out to preselect the access methods that will be used in the test. To preselect the assistive devices, the preliminary tasks of Parts I and II can be used. Key and mouse parameters must be standardized for the test (see the "Material" section). However, if necessary, the key and mouse parameters can be adjusted to the client's abilities. This type of adjustment must be considered as an assistive device and must therefore be noted in the areas aforementioned in the test. One of the objectives of the test is to determine computer use performance as it relates to different access methods, and, consequently, to determine which assistive devices are best suited to the client. Several examples of assistive devices are given below.

2.3 Assistive Devices for Keyboard Functions

- a conventional keyboard (various models available)
- a conventional keyboard that the person uses with one or more mechanical pointers (hand held, head stick, mouth stick, etc.)
- options available in the operating system, for example accessibility options in the control panel of Windows, such as the sticky keys
- alternative keyboards: key guards, ergonomic keyboards, oversize keyboards, undersize keyboards, Intellikeys, one-handed keyboards (Infogrip, Half-Querty, etc.)
- direct-selection on-screen keyboards
- switch-operated, scanning selection on-screen keyboards
- Morse code activated by sip and puff or two switches
- voice recognition software

2.4 Assistive Devices for Mouse Functions

- a conventional mouse (various models available)
- keyboard combinations or shortcuts that can replace mouse commands
- possible options in the operating system, for example inverting the right and left clicks on the mouse in Windows, adjusting the speed of the pointer
- a conventional mouse with a separate switch adapted to do the click
- a trackball (Kensington or Logitech)
- a trackball with a separate switch adapted to do the click
- a joystick turned into a mouse
- a mouse controlled by the head or mouth (Head Mouse, Head Masters, Jouse, etc.) to move the mouse screen pointer, combined with a switch, electronic pointer or specialized software for clicking, double-clicking and dragging
- a mouse controlled by eye movement
- voice-recognition software
- Morse code activated by sipping and puffing or two switches
- a scanning-operated mouse with switches and specialized software
- specialized software such as Magic Cursor and Dragger that do the click, double-click and drag
- a multiple-switch mouse, such as Mouse Mover, Mouse Emulator and Mouse Keys
- a mouse combined with an alternative keyboard such as Intellikeys
- a foot-operated mouse
- different models of ergonomic mice
- Glide Point
- various types of switches and electronic pointers (sight, tongue, sipping and puffing, etc.)

3. INSTRUCTIONS

3.1 General Instructions

- Give the person a general introduction about the goal of the test and how you will proceed.
- The examiner must be on the most suitable side of the subject as determined by the subject's handedness and the assistive devices used. This is most often the subject's dominant side.
- For each task, repeat the instructions as often as needed, and give all the necessary explanations or demonstrations until the person has fully understood the task.
- Have the person practice the task as often as necessary so as to ensure that he or she has fully understood what is required. This also makes it possible to ensure that the computer is ready for the task. If the person is very familiar with computers,

it may be unnecessary to have him or her practise the task. For the standardized and timed tasks, do two timed trials after this practice stage. The time taken to complete the second trial or the mean of the two trials should be used to interpret the results. The measure should be timed at least to the first decimal place.

- The required tasks generally go from the simplest to the most complex or the easiest to the hardest so as to allow people less familiar with computers or assistive devices to gradually grow accustomed to the commands. It is recommended to follow the proposed order. All the tasks can be administered independently from each other and the order in which they are executed may be changed. Furthermore, it is not essential that all the tasks be conducted.
- It is not necessary to conduct the test with the standard keyboard or mouse, as any type of computer access can be used.
- For each task, the part(s) of the body and the assistive device(s) that are used to accomplish it must be noted.
- Ensure that the part(s) of the body used to accomplish each task is (are) in the resting position when starting the task. For example, the hand should be resting on the keyboard or mouse.
- The examiner can stop a task or the test at any time if he or she feels that the person finds the task(s) too difficult, is taking too much time to carry out the task(s) or that the person will assuredly have too many setbacks. Other better-adapted or higher-performance assistive devices can be tried out at this time. The examiner can also decide that he or she has enough information and that the goal of the test has been attained.
- The person being evaluated does not always need to carry out all the tasks in the test. Indeed, the results for the short keyboard tasks show a great deal of coherency, as do the mouse tasks. It is up to the examiner to determine which tasks will provide the necessary information with respect to the person's impairments, assistive devices, the functions to be assessed, etc. If the person only has difficulty with certain tasks, the examiner can limit the test to those specific tasks, for example those involving the keyboard. The result, however, cannot be generalized to all of the tasks. If someone succeeds the hardest tasks, he or she usually succeeds the easier ones. It is preferable to administer the whole test so as to be able to determine overall performance and ensure that all functions essential to computer use have been examined.

3.2 Specific Instructions for Children

- Choose vocabulary that corresponds to the child's developmental level and use your imagination. For example, when explaining how to drag an icon, imagine with the child that the mouse is carrying an object on its back that it must not drop. When explaining the difference between pressing a key several times and holding it down, use the analogy of the difference between walking and running.

- Check to see whether the child has the academic prerequisites for certain standardized keyboard writing tasks and choose the tasks that are appropriate to his or her level. Children at the pre-school level, namely junior kindergarten and kindergarten may not be able to do tasks CK-3, CK-4, and CK-5. It is acceptable to administer only the preliminary tasks to these children. At the end of the first-grade (generally 6 years old) children must be able to succeed on all tasks on the child version. Children in the third-grade (8 and 9 years old) should be able to perform the child version and some tasks on the adult version, such as the task K-3 (sentences). Children in the fourth-grade can perform tasks on the child or the adult version. With children older than 10 years old, only the adult version should be administered. Some tasks on the adult version have been validated for 10 and 11 year old children; these are: K-1, K-4, K-6, and all mouse tasks (M-1 to M-7). Sixth-grade children (12 years old) must perform all tasks on the adult version. The grades used here correspond to the academic level of regular classes. For example, a child that is in a special fourth-grade class could be writing at the regular first-grade level. If the tasks from the adult version are chosen, the child's age must be taken into account when comparing the results with those of other groups. This information serves as a guide and not as a hard and fast rule. The examiner must decide, based on the characteristics of the child and the tasks, whether or not these tasks can be carried out by a given child.
- Standardized keyboard tasks require a specific character size that is indicated in the "preparation" stage of each task. Moreover, the precise number of keys involved in a task is determined during its standardization. It is important to follow these "standards" in order to be able to compare the child's results with those of the validation groups. However, if for any reason it is impossible to follow these standards, the subject's performance can be compared from one trial to another if care is taken to keep the same parameters.
- Depending on the child's age, verbal hints are sometimes required throughout the execution of the task. If hints are given, they must be noted in the observations column. The examiner must determine whether or not the support and stimulation given to the child to complete the task will invalidate the results.
- All the tasks can be administered independently from each other and the order in which they are executed is not important. Nonetheless, since they are generally presented in order of complexity, which is from the simplest to the most complex, it is preferable to follow the proposed order. Furthermore, it is not essential that all the tasks be conducted. Rather, it is better to choose the tasks that are best suited to the child's capacity and academic level. If the examiner needs a timed result, it is preferable to administer all timed tasks to insure a good interpretation of the scores.
- The studies demonstrated that children obtain the best results if: 1) they use both hands for the keyboard tasks; 2) they use the right hand for the keys of the right-hand side of the keyboard and the left hand for the left-hand side, so they do not cross the median line in the execution of the tasks; 3) they alternate their glance between the keyboard and the screen; 4) they practice in a regular way, notably by the use of Internet; 5) they use several fingers in a dissociated way; and 6) they use the mouse on the side where they feel the most comfortable, generally of the

right-hand side or the dominant side. These characteristics must be noted during the administration of the test.

- The age, sex, school level, dominance, experience using the computer, reasons for computer use and the methods used to carry out the tasks are all factors which can influence the results. It is thus necessary to record these characteristics.

4. ASSESSMENT OR CORRECTION CRITERIA

Each task is assessed according to one or two criteria: the success level (qualitative) and the time required in seconds (quantitative). Observations can be provided in addition to the success scale assessment.

The **success level** is measured using a four-element Likert scale:

- ∂ **success (S)**: a task is considered to be successful when the result corresponds to the designated task and is precisely carried out on the first try without a mistake, a retry, an adjustment or an error correction, in a practical length of time;
- **success with errors (SE)**: a task is considered to be successful with errors when the result corresponds to the designated task but the person had some difficulty, made one or more mistakes, adjustments, retries or corrections during the task, lacked some precision or took a very long length of time to perform the task. The maximum number of errors that determines whether a person belongs in this category is indicated for each timed keyboard task;
- ÷ **partial success (PS)**: a task is considered to be partially successful when the person has considerable difficulty carrying it out, only carries it out partially, has made several mistakes, adjustments, retries or corrections during the task or lacked considerable precision. The number of errors that determines whether a person belongs in this category is indicated for each timed keyboard task;
- ≠ **failure (F)**: a task is considered to be a failure when the result does not correspond to the designated task or the person is totally unable of carrying it out.
- Once the test has been completed, the number of errors must be counted for the written tasks. These tasks must be saved in a file or printed out so that they can be corrected later on. There are several categories of errors: typing errors, errors of omission, reversal, uppercase instead of lowercase, too much space between words, incorrect symbols or commands, spelling errors, carelessness, disability to carry out part of the task, and so on.
- Certain keyboard and mouse tasks do not require typing. The level of success must be noted as soon as these tasks have been carried out. Likewise, any difficulties the person might have had and the reasons for them must be noted. If the person cannot

carry out the task, the reasons must also be indicated. Mistakes might include having forgotten a step, not stopping the cursor at the correct place, and so on.

- For tasks that require mouse functions, as well as tasks K-5, K-6, CPK-4, CPK-5, CPK-6 and CK-1 which require keyboard functions, precision must be noted in the success scale. Precision is ranked as *success* (S) when the person follows the given instructions or the lines on the transparencies without making any mistakes, as *success with errors* (SE) when the person succeeds but had some difficulty, as *partial success* (PS) when the person comes more or less close or not close enough to complete the task, and as *failure* (F) when the person is unable of performing the task. The examiner must do the test beforehand to determine the degree of precision that can be attained with the mouse and the transparencies. When assessing the person's precision, the examiner is not directly facing the screen, which can make the object look as if it is poorly positioned. Check these elements out so as not to penalise the person due to limits in the equipment's capabilities. The required precision must correspond to that needed for normal computer use and no more.
- The **time taken** should be measured using the following instructions:
 - start timing as soon as you say "start" and the person starts moving. You can also say "1-2-3 go" for children. Stop timing when the task has been completed. Whenever a task begins and ends by clicking or double-clicking, the clicks mark the beginning and/or end of the time period;
 - if the person is incapable of completing the task, the person is attributed a partial success or failure and the time taken is no longer considered to be relevant information;
 - the person can correct his or her errors, but the stopwatch continues keeping track of the time taken during the corrections. The fact that the person corrected his or her errors must be noted, since this has an impact on the time required. The person is not obliged, however, to correct the errors and can choose whether or not to do so;
 - the examiner must note the time in seconds at least to the first decimal place.
- In addition to the part of the body and the assistive device used for each task, the following elements must be noted under the "observations" heading: posture, compensations, pain, trembling, spastic movements, signs of fatigue and all other elements that can interfere with the carrying out of the task.

5. INTERPRETATION OF THE RESULTS

5.1 Adult Version

- In the test description, each task contains an interpretation section which makes it possible to compare the person's performance with those of other people who have

taken the test previously. Two groups can serve as a basis for comparison, namely the group with impairments and the group without. The group with impairments was composed of 41 people, 17 French speaking and 24 English speaking. These people were generally familiar with the computer and used one or two assistive devices for computer access. The second group was made up of 49 people having no impairments that interfered with computer use, 19 French speaking and 30 English speaking people. They were more or less familiar with the computer, because one of the selection criteria was not to be a professional user of the computer, such as a secretary.

- Data of identical tasks in French and English (K-1 alphabet, K-4 repeating a key, K-5 holding a key, K-6 moving the cursor with the arrow keys and mouse tasks) combined both French and English adult samples.
- A part of the adult test was also administered to a sample of 40 10 and 11 years old French speaking children to compare their results with those of the adult samples. Norms were also determined for 10 and 11 years old children using this sample. Children are slower than adults in keyboard tasks but are faster than adults in mouse tasks.
- The table in each tasks provides the data for each of these groups:
 - the number of subjects (indicated in brackets);
 - the mean and the median of the time measured to carry out the task, in seconds;
 - the standard deviation from the mean, in seconds;
 - the minimum and maximum length of time needed to carry out the task in seconds;
 - the coefficient of variation, that is the standard deviation divided by the mean and multiplied by one hundred to obtain a percentage value.
- The total number of subjects indicated in the tables varies from one task to another since some people were unable of carrying out certain tasks.
- Given the relatively small sample sizes, the mean obtained for each task cannot be considered a true norm. Nonetheless, the mean gives an estimate of the relative performance which can be used as a valid estimate when comparing the results of a subject. The estimate can sometimes be useful when making recommendations concerning computer access.
- The variability across individuals is greater in the group with impairments as opposed to the group without impairments. Indeed, in the group with impairments, the standard deviation is generally greater, the range longer, the means and medians more varied and the variation coefficient (VC) higher. These results are easily explained by the fact that several people in the former group had serious impairments in the upper limbs and had to use assistive devices that had a low performance level. However, other people from the same group used assistive devices such as voice recognition software that allowed them to perform as well as people from the group without impairments. Thus, in comparison to those of the first group, the performances of the group without impairments were much more similar.

- The test was administered twice within an interval of two to seven days so as to verify the reliability of the test tasks. The reliability of the tasks was measured using the intraclass correlation coefficient (ICC). Tables 1 and 2 in the appendix give the ICC for each task. ICCs between .80 and 1.00 are considered to be very reliable results, those from .60 to .79 are considered to be moderately reliable and those below .60 are said to have poor reliability. Table 1 presents the results for adult participants and Table 2 presents the results for the child participants.
- In the adult version, the reliability of the test tasks ranged from .79 to .99 ; all tasks were highly reliable, except “Dragging and Dropping (curves)” which had fair reliability when comparing the second and the fourth trial and a good reliability when comparing the mean of the first two and the last two trials.
- Three categories of factors can influence reliability, namely factors concerning **individuals**, those concerning **equipment** and those concerning the **tasks** characteristics.
- Concerning **individuals**, the stability from one trial to another (reliability) in the results may be due to the fact that people are already familiar with the computer or already at the limit of their capacities. People who are in a learning situation or have the possibility of improving their performance with training have less stable results. People had two ways of varying the results, namely increasing their execution speed or using a different strategy to achieve the same result. In the case of people who have reached the highest possible speed, the only way to go faster is to use another strategy, such as word prediction software, mouse shortcuts, etc. The people without impairments could most often increase their speed and, in the case of certain mouse tasks, use different strategies. Some people with impairments had equipment that allowed them to change strategies in certain tasks. When different strategies were used, task reliability decreased. Then it is necessary to standardize each step of a task to ensure reliability of results.
- The reliability of the **tasks** is also linked to their characteristics. Thus, keyboard tasks are easier to standardize, and, by their very nature, have less chance of variation in the way or the speed with which they are executed. In addition, it is noteworthy that errors in the time measurement of the beginning and end of a shorter task have a greater proportional impact. For example, a measurement error of 1 second in a 10-second task represents an error of 10%, whereas the same error in a 100-second task only represents an error of 1%. In addition, some tasks include a random component that is the possibility of succeeding by chance on the first trial, without considering the ability level; they are tasks K-5, K-6, M-6, and M-7. Because of this characteristic, these tasks must not be chosen to compare performance.
- **Equipment** can also influence reliability. People who use assistive devices that progressively adapt to the user also see their performance vary due to this adaptation effect. This adaptation can be achieved using word prediction and voice recognition software.
- Beside the need to standardize tasks and equipment so as to be able to compare results, it can be deduced from these observations that the person’s own characteristics should guide the examiner in his or her interpretation of the results.

As the performances of the group with impairments remained stable from one day to the next, it would thus seem to be preferable not to test performance differences with two assistive devices on the same day, because the performance will be affected by fatigue more than by the characteristics of the assistive device. The person can, however, practise with the assistive device for one or more days before taking the test, which will thereby improve the reliability of the measurements. Another observation drawn from the administering of the test was the performance difference between situations where people had to concentrate on three elements, namely the keyboard, model and computer screen, as opposed to those with two elements, the model and computer screen. People who knew how to type well did not have to look at the keyboard and therefore only had to concentrate on the other two elements. This was also true for on-screen keyboards. Those who only had to look at two elements made less errors and could go faster.

- The task K-3 consisted in writing two well-known proverbs. These proverbs could be easily memorized, thereby eliminating the need to look at the model and decreasing the number of elements involved. This task turned out to be very reliable in the two groups. It resembled normal, everyday keyboard tasks, thereby reducing the learning effect.
- In short, to be able to compare two results and interpret the differences, only one factor must be varied at a time, that is the equipment or learning. To eliminate the learning effect, this can involve a fairly long practice time for someone who is not familiar with computers or assistive devices. As for the task, it must be completely standardized in all of its steps.
- The results of the analysis of the internal consistency indicate that it is not always necessary for people to carry out all the tasks in the test. Indeed, the results for the short keyboard tasks (K-1 to K-6) show a great deal of coherency, as do the mouse tasks. The task K-7 (text) assessed other abilities (endurance). It is up to the examiner to determine which tasks will provide the necessary information with respect to the person's impairments, assistive devices, the functions to be learned, etc.

General Interpretation

Overall, people who successfully complete all the tasks in relatively short time would be competitive on the job market or at school in terms of computer use. People who successfully complete all the tasks but take more time can also use computers without restriction. However, to complete their work, their planning should take into account the extra time required. Likewise, the assistive device that gave the best results in the tasks will be recommended where suitable. However, to successfully complete all tasks, it will sometimes be necessary to recommend a combination of assistive devices to obtain the best possible performance.

People who successfully complete all the tasks for either the mouse or the keyboard can use the computer interface that best suits them, since it is possible to do several mouse functions from the keyboard and vice versa. People who partially complete mouse or keyboard tasks, who complete them with great difficulty in impractical amounts of time or who do not attain a sufficient level of precision will be limited in their

computer use. Applications that are adapted to their capacities will need to be foreseen if no assistive devices can compensate for their limitations.

5.2 Child Version

The first version of the test was administered to two groups of French-speaking children. The first group consisted of 17 children having impairments with their ages ranging from four to twelve years. The second group consisted of 21 children without impairments and their ages ranged from five to ten years. The children without impairments were more or less familiar with the use of the computer and those with impairments used it every day at school. This first version was also administered to a sample of 21 children having visual impairments, another group of 24 English-speaking children with motor impairments and one of 20 English-speaking children without impairments. The first version of the test retained only the standardized and timed tasks which resulted in good reliability in the three groups of children with impairments. The tasks with weak reliability were eliminated or grouped with the preliminary tasks, to be administered without timing. Table 2 in the Appendix presents the results of every timed task retained in the four samples. The results varied from sample to sample, and this can be explained. Age is one factor which influences the time required to perform a task. Overall, the younger children take more time. The relatively small samples did not allow for calculating results according to age, for example for the 5-year-old children, 6 year-old, etc. The severity of the impairment is another factor which influences the results and the child participants presented with very different abilities. The ability to compare the results of a child to whom the test is administered with these data is thus limited. The evaluation of the psychometric properties in certain tasks and certain samples also demonstrated weaknesses. The internal consistency was unsatisfactory in several samples (Cronbach's alpha lower than .6), indicating an insufficient number of tasks to estimate all the facets of performance in using the computer. The test - retest reliability of certain tasks was insufficient (intraclass correlation coefficient lower than .6), indicating that certain modifications were necessary to these tasks. Therefore, the first version of the test for children could not be used in a reliable and valid way and improvements were necessary. Furthermore, the mean scores obtained in the various samples could not be used to compare performance. Standards or normative values needed to be obtained for each age group.

An improved version of the test for children was developed. Certain tasks were modified and others were added. In Part I (keyboard tasks), the task CK-2 was modified and two new tasks were created (CK-4 and CK-5). Furthermore, the tasks are now conceived to be applicable in many languages using the alphabet, for example, typing the vowels, typing the alphabet, typing syllables or words understandable in several languages such as taxi or date. Part II of the test includes two new timed tasks using the mouse (CM-4 and CM-5). The improved version was administered to more than 100 children without impairments, with ages varying between 5 and 9 years in order to obtain norms or standards. The test was administered twice to a part of this sample to verify the test - retest reliability of the new tasks. Analyses of validity and reliability demonstrate that the new version has better metric properties compared to the previous versions.

In the tables integrated within each task, normative data for each group of children from 5 to 9 years old is presented. These data are the results from children without impairments. Since the tasks were modified to be similar for the English speaking children, the data is identical for the English and French versions of the test for children.

For the children with impairments, the previous data for the tasks which demonstrated good metric properties were retained. As in the adult version, the number of subjects varies from one task to another. It is important to note that norms or standards by age for the children with impairments are impossible to obtain, given the very large variability of impairments. Furthermore, using the computer involves motor, cognitive, perceptual, sensory, affective, and process abilities, as well as the global development of the child. The Test must therefore be useful in the assessment of children who are slow learners and those with developmental delay.

In the new version of the test as in the old one, the reliability varies from one task to another and from one sample to another, but all tasks now have a moderate to good level of reliability. The factors that make the tasks more or less reliable are related to the **tasks**, the **equipment** and the **subjects**. The tasks chosen for the children were often short so as to keep their attention during the test. However, errors in the time measurement of the beginning and end of a shorter task have a greater proportional impact. Furthermore, several children needed to be stimulated or reminded of how to do the task while carrying it out. This factor can lessen reliability since the children's performances can vary from one trial to another. Moreover, there are greater demands on examiners when they administer tests to children since they must supervise more, stimulate, tell stories, make a game out of the task, maintain order, and remind the children of the instructions. It is most certainly more difficult to standardize what has become a game for a child, but it is sometimes the only way of getting the child to complete the task.

Other factors of variability relate to the equipment. It is likely that for children, the manipulation of the mouse corresponds to their experience playing games; pressing on a button to obtain a result (toys "Fisher Price", "Nintendo", etc.), whereas the adult is more familiar with the tasks of writing.

When executing the tasks, the children were often in a learning situation, which can lessen task reliability, as it can with adults. Moreover, children represent a less homogeneous group than do adults. Indeed, a five-year-old child has quite different capabilities than does a nine-year-old as concerns attention, concentration, dexterity, the understanding of instructions, etc. Another aspect which can interfere with task execution is the fact that children are also more easily distracted by their environment.

The age, sex, school level, dominance, experience with the computer, reasons for using the computer and the methods used (see the section 3.2) to carry out the tasks, are all factors which can influence performance. It is thus necessary to take these characteristics into account in the interpretation of the results and the formulation of the resultant recommendations. It is important to note that some of these factors are associated. Age is clearly connected to school level, experience and the reasons for use. In general, as the child advances in age and his/her skills develop, the more he/she acquires new knowledge, is in contact with the computer and thus has more practice, the more he/she develops various uses of the computer and develops effective strategies of use, allowing for the development of new skills to acquire new knowledge.

From the point of view of gender, girls have slightly superior results compared to the boys of the same age in the task requiring writing of words (CK-5). This may be explained by their more developed language skills, which are also noted in their school

performance. The methods used on the keyboard are also associated with performance; children who used a single finger were slower than those who used two, or several fingers when typing. These children had to cross the median line to reach the keys of the keyboard, decreasing their speed. It is thus preferable not to cross the median line and to use both hands to improve performance on keyboard tasks. Furthermore, looking constantly at the keyboard is associated with poorer performance. Learning a typing method is important to improve performance.

A number of tasks from the adult version were administered to a sample of 10 and 11-year-old children; tasks K-1, K-4, K-6 and all the mouse tasks (M-1 to M-7). The normative data from this sample for each task are presented in Tables 3 and 4. The factors associated with better performance were also identified. These factors may be considered when interpreting the results and making recommendations to improve performance. Age is a factor for the writing or keyboard tasks, but not for the task requiring the use of arrows keys (K-6) or for mouse tasks. The 11-year-old children are faster than the 10 year-old-children for these keyboard tasks, and their results are only slightly lower than the adults. On the other hand, 10 and 11-year-old children are faster than adults in the mouse tasks.

From the point of view of gender, 10 and 11-year-old boys are faster than girls of the same age in the mouse tasks M-6 and M-7 as well as in the keyboard task K-6. This may be attributed to the boys' better visual-motor skills. It is possible that their greater experience using computer games can explain this difference. Experience with using the computer improves performance on writing tasks, as well as using the Internet, but is not associated with better performance on mouse tasks. Learning to use the mouse is relatively fast whereas mastery of the keyboard can take several months and even several years of practice. It is thus possible to observe improvements in performance in writing until the mastery of a typing method, which is often achieved at the level of secondary school level or adulthood. Maximal efficiency using the mouse can be reached at 9 years of age or even less if the child has practiced a lot.

6. MATERIAL

- The test focuses on computer use. The brand name, clock speed, memory and other characteristics must be sufficient to complete the tasks. The computer must have the usual peripherals, namely any kind of keyboard and mouse. The computer must also be installed on a work table that suits the person.
- The test works in the Windows and MacOs environments. The operating system must have an initial desktop window with three or more icons. The computer must also have word processing software, such as WordPerfect, Word, Claris Works, etc., in which character size can be varied and the keyboard arrows used.
- The properties of the keyboard and mouse peripherals must be constants, except if it is these elements that are to be compared. The repeat rate of the characters on the keyboard must be intermediate and the repeat delay before a character is repeated must be short for adults and intermediate for children. The speed of the double-click on

the mouse must be slow, the speed of the pointer must be medium and there should be no pointer trail. These parameters are adjustable and verifiable in the operating system's control panel.

- In Part I, when a person is asked to reproduce a written sequence, the model is presented on a sheet placed next to the screen, on the side chosen by the person. The test for adults has five models on paper (Models 1 to 5) and the test for children has five (P-1, P-2, C-1, C-2 and Model 2). The models are reproduced by the examiner using the originals found in the appendix. Once the person did the first trial of a task, the model is written at the screen, he or she then may use this model for the second trial.
- The test for adults uses nine transparencies. These transparency models are found in the models section. It is necessary to highlight certain transparencies guide marks in dark green, namely the starting, stop and final points, to circle the short movements in Transparency 7 and outline the squares on Transparencies 8 and 9. In tasks where transparencies are required, they are placed in front of the screen and held in place by velcro on the sides. The soft velcro strip is on the transparency and the rough strip on the edges of the screen. The transparency should cover most of the screen. The corner indicated on the transparency corresponds to the upper left corner of the screen. There are two series of transparency models available, namely one for 15 inch screens and one for 17 inch screens. The transparency must always be placed in the same way, must not move during the task and must be removed at the end of the task.
- The test for children uses twelve transparencies (P-1 to P-5 and C-1 to C-7). The transparencies are reproduced by the examiner using the originals found in the appendix. The paths must be highlighted with coloured markers to make them easier to see. They are used in the same way as in the adult test (see the preceding paragraph).
- It is necessary to ensure that the computer is ready between each task, namely that the cursor is in the correct position, the visible portion of the text is at the correct place, unnecessary commands have been cancelled, etc.
- In order to facilitate the children's understanding of the instructions, coloured stickers can be used for the tasks. For example, the colour blue can be stuck on the shift key, the colour red on another, and so on.
- In Part I, a file should be created to be used for task K-6 in the adult test and CK-1 in the children's test. The file that can be saved instead of recreated each time the test is administered. Create the file by starting a word processor, then opening a new document which will allow the cursor to be moved across the entire page. This can be done by typing "Enter" followed by a period at the beginning of the line as a guide mark, then pressing down on the space bar until the cursor reaches the right side of the screen and typing "Enter" once again. Copy this line once and then paste it 20 or more times. This will provide a file in which the cursor can be moved over the whole screen.

7. GLOSSARY

- **Cursor:** small flashing vertical line that indicates the place where you are in a document. It is only visible in software that is designed to use it and only in specific areas of the screen.
- **Pointer:** icon that indicates the position of the mouse. It can take different forms depending on the software, but it is generally in the shape of an arrow or vertical bar. It can be used over the whole screen in the Windows and MacOS environments and in all software designed for them.
- **Scroll bars:** bars on the right side and bottom of the screen, which control the display of files and documents. The scroll command buttons in these bars are used to move around in the software.
- **Scroll command buttons:** buttons in the scroll bars on the right side and bottom of the screen. These buttons are used to move around in the software.
- **Drop-down menu:** command button in the software, which, when selected, displays a series of options which may be selected.

8. IDENTIFICATION FORM

Certain information must be gathered before the test is administered. The following text provides an example of the identification and compilation form that can be found in the appendix.

Name :

Birth date (d / m / y):

Sex : M ____ F ____

Diagnosis : specify the diagnosis as well as the degree of impairment or disorder

- degenerative disease
- spinal cord injury
- cerebral palsy
- musculoskeletal impairment
- non-degenerative neuromuscular disease
- other

Education : indicate the highest diploma obtained or the last completed year of school

- primary
- secondary
- college or university

Main occupation : indicate the current occupation and the main previous occupation (if relevant).

- at home
- at school
- at work job:

Name of examiner:

Date (d/m/y)

Time at beginning of test:

Time at end of test :

Computer experience:

- rate and length of use: none ____ low ____ (a few times)
average ____ (occasional use) high ____ (regular use)
- reason for use: games and leisure ____ study ____ work ____
internet ____

Knows a typing method: yes ____ no ____

Dominant side: right ____ left ____

Assistive devices used:

Experience with the assistive device(s) used:

Computer and software used (brand, model, clock speed, memory):

9. TASKS FOR THE ADULT VERSION

PART I

9.1 Tasks Involving Writing and Keyboard Functions

Part I requires the use of word processing software. The test consists of asking the person to carry out the tasks described below. The person should do the tasks at the same speed he or she normally adopts when using the computer rather than trying to do them as quickly as possible. Most of the tasks are timed and the person's work must be saved in a file so that it can be printed out and corrected later on. Press "Enter" three times after each task and put the cursor at the beginning of the line before beginning another task. Provide the following information for each task, namely the length of time taken, success level, observations and whether or not the person made any corrections during the task. **N.B.** Not all the criteria apply in the same way to all the tasks. All the tasks require a short preparation and some require the use of a paper model or transparency. Also, all the tasks can be administered independently from each other. When necessary, consult the "General Instructions" and "Material" sections before beginning the test.

9.1.1 Preliminary Tasks Involving Keyboard Functions

The two tasks in this section are not timed. They are used to determine whether or not the person needs an assistive device to execute this part of the test and, if so, which one to use in the timed tasks.

PK-1) Covering the entire keyboard

- **Preparation:** Show the person the four most distant keys in each corner of the keyboard.
- **Task:** Ask the person to press the four most distant keys in each corner of the keyboard one after another, as well as other keys along the path joining them, such as "3", "g", "m", "p".
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the person obtains a PS or F, an assistive device must be found that allows the person to have access to the whole keyboard such as a hand pointer, mouth stick, mini-keyboard or on-screen keyboard. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, keep it for relevant tasks further on.

PK-2) Executing double or triple keys

- **Preparation:** Show the person the “Shift”, “H”, “Z” and “Enter” keys.
- **Tasks:** 1) Ask the person to hold the “Shift” key down and to press down on the “H”.
2) Then ask the person to hold down the “Shift”, “z” and “Enter” keys for a few seconds. This simulation has no real affect on the computer.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the person obtains a PS or F, you can try an assistive device such as the sticky keys from the Windows operating system. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, keep it for relevant tasks further on.

9.1.2 Standardized and Timed Tasks Involving Keyboard Functions

The seven tasks in this section are timed. They can be used to determine the performance of a person in the use of a computer keyboard or its equivalent. The person’s results in each task can be compared to determine the effect of practice or the contribution of different assistive devices. The person’s results can also be compared with those of the two validation groups, provided in the table included in each task description.

K-1) Alphabet

- **Preparation:** Start the word processing software and open a new document. The cursor must be at the beginning of the document.
- **Task:** Ask the person to write all the letters of the alphabet in alphabetical order with no spaces between the letters. Provide a model only if the person needs it.
- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F Trial 2 S SE PS F
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No __
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (40)	30.6	23.6	26.2	9.0-144.5	87.5%
Without imp. (49)	13.9	11.8	6.0	5.8-43.0	43.5%
10 years old (19)	22.8	19.7	8.6	13.7-43.2	37.9%
11 years old (21)	17.2	15.4	6.1	10.1-32.4	35.6%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as a key guard, on-screen keyboard or voice recognition. You can then redo this task this task to see if the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a person belongs in the SE category is two. If the person makes more than two errors, he or she is ranked in the PS category.

K-2) Writing words

- **Preparation:** Set up Model 1 next to the screen in the position chosen by the person. Put the cursor at the start of a new line and ensure that, at the start of the task, no text can be seen in the visible portion of the screen.
- **Task:** Ask the person to write the following series of words, each word being followed by a comma and a space, as in Model 1. This series of words contains all the letters of the alphabet.

Begin, coffee, windows, kitchen, quote, taxi, lived, sympathetic, jump, zero.

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (24)	106.3	73.9	81.1	22.9-320.5	75.9%
Without imp. (29)	40.4	31.6	21.8	20.7-103.0	54.0%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as voice recognition or word prediction software. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a person belongs in the SE category is two. If the person makes more than two errors, he or she is ranked in the PS category. Task K-2 measures the same functions as K-3. The examiner can choose one or the other or both.

K-3) Writing sentences

- **Preparation:** Set up Model 2 next to the screen in the position chosen by the person. Put the cursor at the start of a new line and ensure that, at the start of the task, no text can be seen in the visible portion of the screen.

- **Task:** Ask the person to write the two following sentences and to move down a line after the first sentence, as in Model 2.

If you want your dreams to come true, don't sleep.
If you can't beat them, join them.

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (24)	140.7	88.3	127.1	24.3-478.9	90.3%
Without imp. (30)	39.1	31.2	26.8	16.1-121.6	68.5%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as voice recognition or word prediction software. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a person belongs in the SE category is two. If the person makes more than two errors, he or she is ranked in the PS category. Task K-2 measures the same functions as K-3. The examiner can choose one or the other or both.

K-4) Repeating keys and double keys
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- **Preparation:** Set Model 3 next to the screen on whatever side the person wishes.
N.B. The repeat rate of the keys can be adjusted and can influence the test result. Make sure this rate suits the person and is identical from one test to another. Comparisons with the results of validation groups must take this variability into account.
- **Task:** Ask the person to write the sequence given in the model, without inserting spaces between the letters and symbols. Do not erase space if the computer creates a space automatically.

qq ;; /// ... !!!!! 0000 11111 &&&&

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (39)	50.7	30.0	55.0	9.4-268.8	108.5%
Without imp. (49)	15.5	14.1	6.2	6.1-42.9	40.3%
10 years old (19)	23.3	23	6.8	13.4-36.6	29.3%
11 years old (21)	17.5	17	3.2	12.9-24.8	18%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as an adjustment of the key repeat rate in the operating system, a key-guard or pointer. You can then redo this task with the assistive device to see whether performance is improved. If the performance is significantly improved with an assistive device, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a person belongs in the SE category is two. If the person makes more than two errors, he or she is ranked in the PS category.

K-5) Holding a key down

- **Preparation:** Put Transparency 1 on the screen and set Model 4 next to the screen on whichever side the person chooses. Put the cursor in the start position. **N.B.** The size of the character influences the number of repetitions required to fill up the space between the two lines on the transparency. The test was standardized with a size-12 character. If the person cannot use this character size, the results cannot really be compared with the timed results of the validation groups.
- **Task:** Ask the person to accurately reproduce the model between the lines of Transparency 1 by holding the designated key down rather than by repeatedly pressing it down. The person may repeatedly press the final few to complete the task.

00000000000000000000000000000000

aa

pp

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (36)	58.6	39.1	52.4	10.6-290.9	89.3%
Without imp. (49)	28.0	24.1	13.9	15.1-91.3	49.8%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as an adjustment of the key repeat rate in the operating system, a key-guard or pointer. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

K-6) Moving the cursor with the keys

- **Preparation:** Open the file created for this task, set Transparency 2 over the screen and put the cursor in the start position. **N.B.** The repeat rate of the keys is adjustable and can influence the result of the test. Ensure that the rate suits the person and is the same from one trial to the next. Comparisons with the results of the validation groups must take this variability into account.
- **Task:** Ask the person to move the cursor along the proposed path using the keyboard arrows by holding the designated key down rather than by repeatedly pressing it down.
- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (22)	50.8	39.5	33.5	24.0-178.4	65.9%
Without imp. (30)	30.8	28.2	10.6	18.4-72.5	34.4%
10-11 years old (40)	29.4	29.9	7.6	16.8-51.3	26.0%

If the time taken by the person is ranked among the poorest performances, or the person obtains a PS or F, try using an assistive device such as an adjustment of the cursor parameters in the operating system, a key-guard, pointer or voice recognition. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. In certain circumstances, the cursor can be moved with the arrows instead of with the mouse and vice versa.

Close the file of task K-6 and return to the initial file of the word processor.

Print and save the written work of this section for later correction.

Quit the word processing software and note the name of the file. The file will be used again at the end of the section in the assessment of mouse performance in task K-7. Now move on to Part II for the mouse performance assessment.

K-7) Integrated task: text

The text used here contains almost all the keys. **N.B.** This task must be carried out after the section assessing mouse performance. Do not have the person execute this task if he or she had considerable difficulties in the preceding tasks or if he or she has been working at the computer for more than an hour and a half. Do not forget to save the work for correction purposes.

- **Preparation:** Start the word processing software used in Part I and open the file in which Part I of the test was kept. Put the cursor at the beginning of a line. Put the Model 5 on a page next to the screen on the side chosen by the person.

- **Task:** Ask the person to write the text without putting the words in italics.

* I must write a text about the zoo “X” and believe me it is not easy! There are rare words like *wapipti* & *koala*. In addition, I must write the cage numbers to indicate where the animals are: for example #36\54 or #29|07 and I must explain the rates (-10% for people younger than 8 years old; adults = 6\$ + taxes if < 65 years old and 5\$ + taxes if > 65 years old). Could you help me?

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F Trial 2 S SE PS F
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Stan. Devi.	Min.-Max	Coef. Vari.
With imp. (9)	313.2	292.5	128.1	132.6-518.4	40.9%
Without imp. (26)	212.2	188.6	69.7	133.0-380.2	32.8%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device. You can then redo this task with the assistive device to see whether performance is improved. The maximum number of errors that determines whether a person belongs in the SE category is seven. If the person makes more than seven errors, he or she is ranked in the PS category. Leaving out a tab at the beginning of the text is not considered to be an error. Likewise, the presence or absence of spaces between the = + < > signs are not seen as errors.

K-7-b) Selecting with the mouse pointer

- **Preparation:** Place the text that was written in task K-7 so that it is entirely visible on the screen.

- **Task:** Ask the person to highlight selected words with the mouse pointer and then put them in italics, as shown in the model.

- **Success level:** S SE PS F **Observations:**

- **Interpretation:** If the person obtains a PS or F, try using an assistive device. You can then redo this task with the assistive device to check whether the performance is improved.

9.2 Tasks Involving Pointer and Mouse Functions

Part II is conducted using the initial desktop window that appears on the screen in the Windows or MacOS environments. The tasks comprise the use of icons, windows, menus and other functions of certain software that require the use of the pointer and mouse. The person must do the designated tasks at the same speed that he or she normally adopts when using the computer. Several tasks are timed. They require a short amount of preparation and some use a model or transparency. The requested information must be filled out for each task. Do not forget to assess precision with the success scale and to take the appropriate notes in the observations column. Since certain tasks are optional, it is up to the examiner to determine whether the person being assessed needs to do them. When necessary, consult the “General Instructions” and “Material” sections before beginning the test.

9.2.1 Preliminary Tasks Involving Mouse Functions

The tasks in this section are not timed. They can be used to determine whether the person needs an assistive device and, if so, which one. They comprise all the functions that are conducted with the mouse.

PM-1) Using the mouse

- **Preparation:** The initial desktop window is showing on the computer screen. No software has been started nor files opened, and several icons are available.
- **Tasks:** Ask the person to do the following tasks:
 - Left-click

Success level:	S	SE	PS	F	Observations:
-----------------------	---	----	----	---	----------------------
 - Right-click (if applicable)

Success level:	S	SE	PS	F	Observations:
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 - Double-left click

Success level:	S	SE	PS	F	Observations:
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- Move the pointer around the whole screen
Success level: S SE PS F **Observations:**

- Move (drag) an icon around the whole screen
Success level: S SE PS F **Observations:**

PM-2) Moving around in a document using the scroll bar

- **Preparation:** Choose software that has drop-down menus and a scroll bar on the right side such as a word processor or navigator. Once this software has been started, it will be used to assess series of tasks involving moving around in a document and drop-down menus.

- **Tasks:** Ask the person to execute the following user actions:

- Start the software with the appropriate command
Success level: S SE PS F **Observations:**

- Move around in the document using the following methods:
 - a) put the pointer on the scroll button that controls page forwarding, namely the square with a downward-pointing arrow in the bar on the right side. Hold the left mouse button down. Do the same manoeuvre with the button that controls the movement towards the top of the document.
 - b) click the scroll button that indicates the position in the document. Move through the document by holding the left mouse button down and dragging the scroll button downward.
 - c) click on the scroll bar to jump from one place to another or from one page to another.

Success level: S SE PS F **Observations:**

PM-3) Moving around in drop-down menus

- **Preparation:** Choose software that has drop-down menus, for example a word processor or navigator.

- **Tasks:** Ask the person to do the following actions using the **left-click:**

- **Method 1.** Move around in the drop-down menus: click the second menu at the top of the screen, then the fifth command (for example, Paste in the Edit menu of Microsoft Word). Ask the person to point to the chosen menu, left click, point to the chosen command and left click again.

Success level: S SE PS F **Observations:**

- **Method 2.** Move around in the drop-down menus: cancel the previous command if it resulted in an operation. This time, have the person redo the preceding task by pointing to the chosen menu, left clicking, holding the left mouse button down, pointing to the chosen command and releasing the mouse button on the command.

Success level: S SE PS F **Observations:**

- **Tasks:** Ask the person to do the following actions using the **right-click:**

- **Method 1.** Move around in the drop-down menus (Windows only): choose the fourth command of the menu which appears when a right-click is made in the initial desktop window. Ask the person to right click, point to the chosen command and left click.

Success level: S SE PS F **Observations:**

- **Method 2.** Move around in the drop-down menus (Windows only): cancel the previous command if it resulted in an operation. Have the person begin again by right clicking, holding the mouse button down, pointing to the chosen command and releasing the mouse button on the command.

Success level: S SE PS F **Observations:**

N.B. The successful completion of tasks with the right-click is not essential for computer use. This user action permits shortcuts for certain commands that can be accomplished in other ways.

PM-4) Using windows

- **Preparation:** Choose an icon that opens a window. This window must cover a quarter of the screen once it is opened. Adjust it if necessary.

- **Tasks:**

- Ask the person to open the chosen window by double-clicking the appropriate place.

Success level: S SE PS F **Observations:**

- Ask the person to move the window in different directions.

Success level: S SE PS F **Observations:**

- Ask the person to make the window bigger or smaller by clicking the appropriate place in the upper corner of the window or in the task bar.

Success level: S SE PS F **Observations:**

- Ask the person to close the window by clicking the appropriate place in the upper corner of the window.

Success level: S SE PS F **Observations:**

PM-5) Combining mouse and keyboard tasks

- **Preparation:** The initial desktop window is showing on the computer screen and several icons are available.
- **Task:** Ask the person to drag an icon while the “Caps Lock” is on. This user action is a simulation that has no real effect. Successfully completing this task is not essential for computer use; it permits shortcuts for certain commands that can be accomplished in other ways.
- **Success level:** S SE PS F **Observations:**

Interpretation: If the person successfully completes the preliminary tasks, move on to the following tasks. If the person obtains a PS or F, you can adjust the mouse parameters in the operating system or try another type of mouse or assistive device such as trackball, Head Mouse, Head Masters, Jouse, voice recognition, the Dragger program or other mouse emulator. If the person obtains a S or SE with an assistive device or another adjustment, note it in the observations column and keep this device for use in relevant tasks.

9.2.2 Standardized and Timed Tasks Involving Mouse Functions

The seven tasks in this section are timed. They can be used to assess a person's performance when using the mouse or its equivalent. The person's results in each task can be compared using different assistive devices. The person's results can also be compared with those of the two validation groups provided in the table included in each task description. See the correction criteria section (4) to evaluate the level of precision.

M-1) Pointing and clicking

- **Preparation:** Set up Transparency 3 in front of the screen and put the pointer in the middle of the screen. The pointer must not be moved until the examiner says to start.
- **Task:** Ask the person to use the pointer to follow paths 1 to 4 there and back. The person must click at the start and at the end, which are one and the same positions. They should not click at the point where they change direction.
- Path 1: Success level: S SE PS F Observations:
Path 2: Success level: S SE PS F Observations:
Path 3: Success level: S SE PS F Observations:
Path 4: Success level: S SE PS F Observations:

Length of time total for path 1 to 4: Trial 1 _____ Trial 2 _____
Total success level: Trial 1 S SE PS F Trial 2 S SE PS F
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (37)	44.7	34.7	30.7	11.8-123.3	68.7%
Without imp. (49)	25.4	19.4	26.4	8.1-171.6	103.9%
10-11 years old (40)	11.7	11.5	3.2	6.8-21.4	27.0%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as trackball, adapted mouse, etc. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

M-2) Dragging and dropping (curved path)

- **Preparation:** Put Transparency 4 in front of the screen, choose an icon and move it to the start position. The pointer must not be moved until the examiner says to start. Place the other icons so that they do not hinder this manoeuvre.
- **Task:** Ask the person to drag the icon along the path and return the icon along the path to the start position without dropping the icon.
- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F Trial 2 S SE PS F
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (18)	53.7	38.1	35.7	16.2-160.4	66.5%
Without imp. (30)	33.0	26.7	33.4	12.1-199.9	101.2%
10-11 years old (40)	11.6	11.5	3.2	6.8-20.1	27.4%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. **N.B.** Curved paths cannot be accomplished with voice recognition software or mouse commands activated through scanning (e.g. Wivik) or Morse code.

M-3) Dragging and dropping (right-angled path)

- **Preparation:** Put Transparency 5 in front of the screen, choose an icon and move it to the start position. The pointer must not be moved until the examiner says to start. Place the other icons so that they do not hinder this manoeuvre.

- **Task:** Ask the person to drag the icon along the path and to return the icon along the path to the start position without dropping the icon.
- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F Trial 2 S SE PS F
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (34)	38.2	21.8	54.7	9.7-323.0	143.1%
Without imp. (49)	17.1	14.5	9.9	7.2-62.6	57.7%
10-11 years old (40)	8.9	8.7	2.3	5.9-16.2	26%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

M-4) Stopping the pointer at a precise location and double-clicking

- **Preparation:** Put Transparency 6 in front of the screen. The pointer must be at the start position and must not be moved until the examiner says to start. Move the icons outside the stop zones so as not to open any software during this manoeuvre.
- **Task:** Ask the person to follow the numbered sequence, stopping the pointer at the indicated places and double-clicking at each stop.
- Stop 1: Success level: S SE PS F Observations:
 Stop 2: Success level: S SE PS F Observations:
 Stop 3: Success level: S SE PS F Observations:
 Stop 4: Success level: S SE PS F Observations:
 Stop 5: Success level: S SE PS F Observations:
 Stop 6: Success level: S SE PS F Observations:
- **Length of time:** Trial 1 _____ Trial 2 _____
Global success level: Trial 1 S SE PS F Trial 2 S SE PS F
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (39)	24.0	16.0	35.2	6.7-231.9	146.5%
Without imp. (49)	9.2	8.3	3.7	4.2-22.9	40.1%
10-11 years old (40)	6.4	6.3	1.4	4-9.6	22.0%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device such as the Dragger program or an adjustment of the double-click speed in the operating software. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

M-5) Dragging and dropping (repeated actions)

- **Preparation:** Put Transparency 7 in front of the screen, choose an icon and move it to point A, the start position. The other icons must be outside the zones indicated on the transparency so that they do not hinder this manoeuvre. The pointer must be in the centre of the screen and must not be moved until the examiner says to start.
- **Task:** Ask the person to move the icon at point A to point A', then to point B, to point B' and so on. The icon must be dropped at each stop, then dragged to the next stop.
- Path A: Success level: S SE PS F Observations:
- Path B: Success level: S SE PS F Observations:
- Path C: Success level: S SE PS F Observations:
- Path D: Success level: S SE PS F Observations:
- Path E: Success level: S SE PS F Observations:
- Path F: Success level: S SE PS F Observations:
- **Length of time:** Trial 1 _____ Trial 2 _____
Global success level: Trial 1 S SE PS F Trial 2 S SE PS F
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (34)	41.9	29.7	51.3	13.0-307.2	122.5%
Without imp. (49)	16.1	14.3	5.9	8.2-42.2	36.9%
10-11 years old (40)	12.5	11.5	3.5	7.6-23.6	27.9%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. This task is one of the most demanding in Part II due to the numerous repeated actions.

M-6) Changing a window's size using the edges

- **Preparation:** Put Transparency 8 in front of the screen. Adjust the size of the window so that it corresponds to the START rectangle on the transparency. The window must be modified by the sides, top and bottom. The pointer, whose start

position is between the two rectangles, must not be moved until the examiner says to start.

- **Task:** Ask the person to use the sides to change the window size by carrying out the three steps of Transparency 8. The first step is to move the window by dragging its bottom right corner to the bottom right corner of the FINISH rectangle on the transparency. The second is to shrink the window from the left side so that it has the same width as the FINISH rectangle. The last step is to make the window bigger at the top end so that it is the same height as the FINISH rectangle.

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (35)	26.6	19.8	18.3	7.5-69.9	68.8%
Without imp. (49)	13.8	11.2	7.6	5.8-40.3	54.9%
10-11 years old (40)	8.6	8.3	2.2	5.8-15.5	25.4%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device. For example, you could enlarge window border by the command Active window border, in the menu Appearance of the icon Display of the Control panel of Windows. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

M-7) Changing a window's size using the corners

- **Preparation:** Put Transparency 9 in front of the screen. Adjust the size of the window so that it corresponds to the START rectangle on the transparency. The window must be modified using the top left corner. The pointer, whose start position is between the two rectangles, must not be moved until the examiner says to start.
- **Task:** Ask the person to use the top left corner to change the window size by carrying out the two steps of Transparency 9. The first step is to move the window by dragging its bottom right corner to the bottom right corner of the FINISH rectangle on the transparency. The second is to change the size of the window by dragging its top left corner so that it becomes the same size as the FINISH rectangle.

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With imp. (36)	24.1	15.2	25.5	5.5-140.0	105.6%
Without imp. (49)	8.6	7.4	4.8	3.4-29.9	56.2%
10-11 years old (40)	5.9	5.5	2.0	3.2-14.1	33.7%

If the time taken by the person is ranked among the poorest performances, or if the person obtains a PS or F, try using an assistive device. For example, you could enlarge window border by the command Active window border, in the menu Appearance of the icon Display of the Control panel of Windows. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

After having completed Part II, return to Part I for tasks K-7 and K-7-b. Task K-7 is the longest and most demanding task in terms of endurance. If the person has taken more than an hour and a half to reach this point in the test, do not ask them to execute tasks K-7 and K-7-b. This is likewise true if the person is feeling tired, is in pain or has another problem that could keep them from doing these tasks.

Part III

9.3 Questions About User Satisfaction with the Assistive Devices

If you have tried one or another of the assistive devices for computer access while taking the test, which one best suited you and why?

Do you think you could use the one you tried and preferred here all on your own?

Do you think it is important that you be able to use it all on your own?

Are you comfortable using this assistive device?

How do you think it looks?

Do you have any comments or suggestions that would help us make better recommendations for the best assistive device for you?

10. Tasks for the Child Version

Part I

10.1 Tasks Involving Writing and Keyboard Functions

Part I uses word processing software which is used for all the tasks involved. The test consists in asking the child to carry out the tasks described below. The child should do the tasks at the same speed he or she normally adopts when using the computer rather than trying to do them as quickly as possible. Certain tasks are timed and the child's work must be saved in a file so that it can be printed out and corrected later on. However, since the complexity of the tasks has been adapted for the children, their work can easily be corrected immediately. After each task, put the cursor at the beginning of a line and press "Enter" until an empty screen is created. For each task, provide the following information, the length of time taken, success level, observations and whether the child made any corrections during the task. **N.B.** Not all the criteria apply in the same way to all the tasks. All the tasks require a short preparation and some use of a paper model or transparency. When necessary, consult the "General Instructions" and "Material" sections before beginning the test. It is worth noting that certain tasks have academic prerequisites. Tasks CK-3, CK-4 and CK-5 are only conducted by children who have the necessary academic level. Likewise, other tasks are considered to be optional and are marked with an asterisk. The examiner must decide whether it is necessary to assess these tasks. The results for each timed task are presented in a table which includes the different samples of children who received the test. These samples are: 1) French speaking children with motor impairments (With Imp. F.); 2) English speaking children with motor impairments (With Imp. E.); 3) French speaking children with visual impairments (Vis. Imp.); and 4) children without impairments from 5 to 9 years old.

10.1.1 Preliminary Tasks Involving Keyboard Functions

The tasks in this section are not timed. They are used to determine whether or not the child needs an assistive device to execute this part of the test and, if so, which one to use in the timed tasks. Certain preliminary tasks are optional and are indicated with an asterisk. All the tasks in this section can be administered independently from each other and the order in which they are executed must be adapted to the child (easiest to hardest).

CPK-1) Covering the entire keyboard

- **Preparation:** Show the child the four most distant keys in each corner of the keyboard.
- **Task:** Ask the child to press the four most distant keys in each corner of the keyboard one after another, as well as other keys along the path joining them, such as "3", "g", "m", "p".

- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the child obtains PS or F, an assistive device must be found that allows the child to have access to the whole keyboard such as a hand pointer, head-stick, mouth stick, mini-keyboard or key-guard. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CPK-2) Executing double keys

- **Preparation:** Show the child the left and right “Shift” keys as well as the key that corresponds to the child’s age, for example, “5”.
- **Tasks:** Ask the child to hold down the right “Shift” key and, at the same time, hit the key with his or her age on it. Now ask the child to redo this task by holding down the left “Shift” key and the same number as before.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the child obtains a PS or F, you can try an assistive device such as the sticky keys from the Windows operating system. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CPK-3) Executing double keys and complex series of keys*

- **Preparation:** Start word processing software and open a new document. The cursor must be at the beginning of the document. Show the child where the “Shift”, “:”, “-”, “(” and “)” keys are. Using these keys, show the child how to make a happy and sad face appear. Happy and sad faces (☺ and ☹) can be made in certain word processing software with this series of keys. Check this out beforehand. Use Models P-1 and P-2 where necessary. Choose a character size that is suitable for the child. For example, a character size of 48 is more user-friendly for a young child. Coloured stickers can be put on the designated keys to facilitate the task for the young child.
- **Task:** Ask the child to make a happy and sad face appear.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** This task assesses the same motor functions as the preceding task, but, because it is more complex, performance can be better determined. If the child obtains a PS or F, you can try an assistive device such as the sticky keys from the Windows operating system. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive

device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CPK-4) Holding down a key

- **Preparation:** Set up Transparency P-1 in front of the screen. Use character size 48. For each task, put the cursor at the beginning of the space to be filled in. Coloured stickers can be put on the designated keys to facilitate the task for the child. The child may choose one path, the other, or both. Models in the appendix may be used to illustrate the task.

- **Task:** Ask the child to execute the following task by holding down the following key(s) instead of by repeatedly pressing it (them).

- * 1 - Make the rabbit run to the carrot using the “ . ” key.

Success level: S SE PS F **Observations:**

- * 2 - Fill in the broken road with the “Shift” and “ _ ” keys so that the car can keep going.

Success level: S SE PS F **Observations:**

- **Interpretation:** If the child obtains a PS or F, try using an assistive device such as an adjustment of the key repeat rate in the operating system, a key-guard or pointer. You can then redo this task with the assistive device to see whether performance is significantly improved. If the performance is significantly improved, note it in the observations column and keep this device for use in relevant tasks.

CPK-5) Repeating keys

- **Preparation:** Put Transparency P-2 in front of the screen. Use character size 48. For each task, put the cursor at the beginning of the space to be filled in. Coloured stickers can be put on the designated keys to facilitate the task for the child. Models in the appendix may be used to illustrate the task.

- **Task:** Ask the child to execute the following task by releasing the designated key between each repetition instead of by holding it down until the end.

Make the elephant walk to the peanuts by taking big steps with the help of the small “o”.

• **Success level:** S SE PS F **Observations:**

- **Interpretation:** If the child obtains a PS or F, try using an assistive device such as an adjustment of the key repeat rate in the operating system, a key-guard or pointer. You can then redo this task with the assistive device to see whether performance is

improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CPK-6) Repeating keys and double keys *

- **Preparation:** Put Transparency P-2 in front of the screen. Use character size 48. For each task, put the cursor at the beginning of the space to be filled in. Coloured stickers can be put on the designated keys to facilitate the task for the child. Models in the appendix may be used to illustrate the task.
- **Task:** Ask the child to execute the following task by releasing the designated key between each repetition instead of by holding it down until the end. The “Shift” or “AltCar” key is, however, held down continuously.

Make waves for a boat by using the “Shift” or “Alt Car” and “~” keys so that the boat can continue to float along.

- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the child obtains a PS or F, try using an assistive device such as an adjustment of the key repeat rate in the operating system, a key-guard or pointer. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

10.1.2 Standardized and Timed Tasks Involving Keyboard Functions

The four tasks in this section are timed. Some of them are adapted to children who know the alphabet or how to write. They can be used to determine the level of a child computer's use. The child's results in each task can be compared to determine the effect of practice or the contribution of different assistive devices. The child's results can also be compared with those obtained by the other validation groups if age and other variables are taken into account. The number of subjects in each group is indicated in parenthesis. The level of reliability is also indicated, as well as other characteristics (mean, median, standard deviation, minimum-maximum).

CK-1) Moving the cursor with the keys

- **Preparation:** Open the file that was created for this task (see the last point of the “Material” section for more information). Put Transparency C-1 in front of the screen and bring the cursor to the start position. Use character size 12. Coloured stickers can be put on the designated keys to facilitate the task for the child. **N.B.** The key repeat rate and character size are adjustable and can influence the result. Make sure they suit the child and are the same from one trial to the next. Comparisons with the results of the validation groups must take this variability into account. The model of the four keys seen in this task can be use when giving explanations to the child (Appendix).

- **Task:** Ask the child to show Charlie, who is lost, the way home by moving the cursor along the path using the keyboard arrows.
- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
With Imp. F. (17)	45.4	35.1	31.1	11.6-142.4	68.5%	Good
With Imp. A. (20)	70.1	55.8	34.6	30.4-175.3	49.4%	Good
Vis. Imp. (22)	46.7	35.0	28.3	15-128	60.6%	Good
5 years old (17)	45.8	38.8	25.1	21.9-116.4	54.7%	Moderate
6 years old (31)	35.4	34.7	10.0	16.1-61.4	28.2%	
7 years old (29)	30.4	29.6	9.0	17.5-61.7	29.8%	
8 years old (23)	26.2	24.6	7.0	15.6-40.9	26.7%	
9 years old (14)	22.7	21.5	4.8	15.7-31.5	21.1%	

If the time required by the child ranks among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as an adjustment of the cursor parameters in the operating system, a key-guard or pointer. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CK-2) Vowels

- **Preparation:** Close the file from the preceding task (CK-1) and return to the initial file of the word processor. Check the child's knowledge of vowels and where to find them on the keyboard. This is necessary for task execution. Put Transparency C-2 in front of the screen. Bring the cursor to the start of the dotted line. Activate the automatic capital letters function. Use character size 48.
- **Task:** Ask the child to write the following sequence of vowels with no spaces between them.

AEIOUAEIOU

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RÉSULTS	Mean	Median	Std. Dev.	Min.-max.	Coef. Varia.	Reliability
With Imp. A. (24)	23.2	16.2	20.6	5.5-80.6	88.8%	Good
5 years old (17)	46.2	40.2	30.9	6.3-121.2	66.9%	Moderate
6 years old (32)	21.8	19.5	13.9	4.7-58.3	63.7%	
7 years old (29)	9.5	7.8	4.2	5.0-21.9	44.5%	
8 years old (23)	9.0	7.2	5.3	3.5-23.4	59.2%	
9 years old (14)	7.4	5.8	3.9	4.5-18.2	53.2%	

If the time required by the child ranks among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as an alternative keyboard or key-guard. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a child belongs in the SE category is two. If the child makes more than two errors, he or she is ranked in the PS category.

CK-3) Alphabet

- **Preparation:** First check the child's knowledge of the alphabet. This is necessary for task execution. To carry out this task, the child must know all of the letters in alphabetical order and be able to name them so as to be able to find them on the keyboard without a model. Choose a character size that suits the child. For example, if the child is quite young, a character size of 48 or greater may be more user-friendly. It is also possible to turn-on "Caps Lock", the automatic capital letters function, depending on the child's preference and education level. Put the cursor at the start of a new line and ensure that, at the start of the task, no text can be seen in the visible portion of the screen.
- **Task:** Ask the child to write all the letters in alphabetical order without leaving any spaces between the letters.
- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RÉSULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
With Imp. F. (9)	97.4	57.5	66.6	33.2-215.1	68.4%	Good
With Imp. A (23)	75.1	62.2	53.6	15.9-201.0	71.4%	Good
Vis. Imp. (18)	87.1	53	84.7	23-43	97.2%	Good
5 years old (7)	150.4	155.2	83.9	36.0-275.1	55.4%	Good
6 years old (13)	54.6	36.8	39.4	24.2-143.9	72.2%	
7 years old (29)	42.3	39.0	13.1	21.5-75.0	31.0%	
8 years old (23)	36.5	31.2	16.3	14.2-70.5	44.8%	
9 years old (14)	34.5	28.6	18.6	19.2-79.2	53.9%	
10 years old (19)	22.8	19.7	8.6	13.7-43.2	37.9%	
11 years old (21)	17.2	15.4	6.1	10.1-32.4	35.6%	

If the time required by the child ranks among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as a key-guard or on-screen keyboard. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a child belongs in the SE category is two. If the child makes more than two errors, he or she is ranked in the PS category.

CK-4) Syllables

- **Preparation:** Show Model C-1 to the child. Choose a character size that suits the child. For example, if the child is quite young, a character size of 48 or greater may be more user-friendly. It is also possible to turn-on “Caps Lock”, the automatic capital letters function, depending on the child’s preference and education level. Put the cursor at the start of a new line and ensure that, at the start of the task, no text can be seen in the visible portion of the screen.

- **Task:** Ask the child to write the following syllables, putting spaces between the words, as shown in Model C-1.

par ten mis

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
5 years old (5)	59.1	50.6	20.5	38.3-85.9	70.6%	Good
6 years old (13)	37.0	29.5	28.7	13.2-112.7	77.6%	
7 years old (29)	17.0	17.0	6.2	6.9-31.0	36.4%	
8 years old (23)	10.6	8.7	5.5	5.2-25.0	52.0%	
9 years old (14)	9.4	7.6	4.9	3.2-17.4	52.0%	

If the time taken by the child is ranked among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as a keyguard, a virtual keyboard etc. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a child belongs in the SE category is two. If the child makes more than two errors, he or she is ranked in the PS category.

CK-5) Words

- **Preparation:** Show Model C-2 to the child. Choose a character size that suits the child. For example, if the child is quite young, a character size of 48 or greater may be more user-friendly. It is also possible to turn-on “Caps Lock”, the automatic capital letters function, depending on the child’s preference and education level. Put the cursor at the start of a new line and ensure that, at the start of the task, no text can be seen in the visible portion of the screen.
- **Task:** Ask the child to write the following words, putting spaces between the words, as shown in Model C-2.

brave date accent radio taxi

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
5 years old (5)	181.8	201.0	70.0	98.8-250.3	38.5%	
6 years old (11)	82.8	74.5	36.7	36.7-159.0	42.3%	
7 years old (26)	58.3	56.6	21.6	24.9-11.8	37.1%	Good
8 years old (23)	38.8	33.1	17.3	19.5-75.2	44.4%	
9 years old (14)	30.9	28.7	12.9	11.6-59.8	41.7%	

If the time taken by the child is ranked among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as a keyguard, a virtual keyboard etc. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a child belongs in the SE category is two. If the child makes more than two errors, he or she is ranked in the PS category.

K-3) Writing sentences *

- **Preparation:** Set Model 2 from the adult version next to the screen on whatever side the child wishes. Put the cursor at the start of a new line and ensure that, at the start of the task, no text can be seen in the visible portion of the screen. Choose a character size that suits the child. **N.B. Knowledge of the alphabet and words is a prerequisite to the execution of this task.** If necessary, show the child how to make capital letters and a period.
- **Task:** Ask the child to write the following sentences, putting spaces between the words, a capital letter at the beginning and a period at the end, as shown in Model 2.

If you want your dreams to come true, don't sleep.
If you can't beat them, join them.

- **Length of time:** Trial 1 _____ Trial 2 _____
Success level: Trial 1 S SE PS F _____ Trial 2 S SE PS F _____
Corrections made during the task: Trial 1: Yes__ No__ Trial 2: Yes__ No__
Observations:
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.-Max	Coef. Vari.
With Imp. (16)	222.2	147.8	147.4	69.5-555.3	66.3%
Without Imp. (15)	141.0	98.2	115.9	43.7-404.0	82.2%

If the time taken by the child is ranked among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as on screen keyboard, word-prediction software etc. You can then redo this task with the assistive device to see whether performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. The maximum number of errors that determines whether a child belongs in the SE category is two. If the child makes more than two errors, he or she is ranked in the PS category.

The written work of this section can be printed and saved for later correction. These tasks can also be corrected one by one as they are completed by the child.

Now exit the word processing software and move on to Part II in which mouse performance is assessed. Depending on the child's concentration and fatigue level, it might be advisable to take a break before carrying out mouse tasks.

10.2 Tasks Involving Pointer and Mouse Functions

Part II is conducted using the initial desktop window that appears on the screen in the Windows or MacOs environments. The tasks comprise the use of icons, windows, menus and other functions of certain software that require the use of the pointer and mouse. The child must do the tasks at the same speed that he or she normally adopts when using the computer. Several tasks are timed. They require a short amount of preparation and some use a model or a transparency. The requested information must be filled out for each task. Do not forget to assess precision with the success scale and to take the appropriate notes in the observations column. Since certain tasks, marked with an asterisk, are optional, it is up to the examiner to determine the ability and needs of the child. When necessary, consult the "General Instructions" and "Material" sections before beginning the test. Remember to use simple and clear vocabulary that suit the child.

10.2.1 Preliminary Tasks Involving Mouse Functions

The tasks in this section are not timed. They can be used to determine whether the child needs an assistive device and, if so, which one. They entail all the functions that are conducted with the mouse. Depending on the child's needs and abilities, the examiner can decide whether to assess certain optional preliminary tasks indicated with an asterisk.

CPM-1) Using the mouse

- **Preparation:** The initial desktop window is showing on the computer screen. No software has been started nor files opened, and several icons are available.
- **Tasks:** Ask the child to do the following tasks:
 - Left-click

Success level:	S	SE	PS	F	Observations:
-----------------------	---	----	----	---	----------------------
 - Right-click (if applicable)

Success level:	S	SE	PS	F	Observations:
-----------------------	---	----	----	---	----------------------
 - Double-left click

Success level:	S	SE	PS	F	Observations:
-----------------------	---	----	----	---	----------------------
 - Move the pointer around the whole screen

Success level:	S	SE	PS	F	Observations:
-----------------------	---	----	----	---	----------------------
 - Move (drag) an icon around the whole screen

Success level:	S	SE	PS	F	Observations:
-----------------------	---	----	----	---	----------------------

CPM-2) Dragging and dropping (curved path)

- **Preparation:** Put Transparency P-3 in front of the screen, choose an icon and move it to the start position, which corresponds to the empty square drawn next to the mouse. The pointer must not be moved until the examiner says to start. Place the other icons so that they do not hinder this manoeuvre.
- **Task:** Ask the child to drag the icon along the path. Depending on the child's level, explain to the child that the idea is to help the mouse carry something in his backpack to the cage without dropping it. The mouse must follow the path and not step outside.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the child obtains a PS or F, try using an assistive device such as a trackball or the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. **N.B.** Curved paths cannot be accomplished with voice recognition software or mouse commands activated through scanning (e.g. Wivik) or Morse code.

CPM-3) Dragging and dropping (right-angled path)

- **Preparation:** Put Transparency P-4 in front of the screen, choose an icon and move it to the start position, the empty square drawn next to the mouse which represents his backpack. The pointer must not be moved until the examiner says to start. Place the other icons so that they do not hinder this manoeuvre.
- **Task:** Ask the child to drag the icon along the path. The explanation given to the child is the same as for the preceding task, CPM-2, except that, this time, the path is right-angled.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the child obtains a PS or F, try using an assistive device such as a trackball, a mouse emulator or the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CPM-4) Dragging and dropping (repeated actions)

- **Preparation:** Put Transparency P-5 in front of the screen. Choose 3 icons and put them inside the three empty boxes on the left. Move the other icons so that they are outside of the zones indicated on the transparency, that is the left and right boxes, and do not hinder this manoeuvre. The pointer must not be moved until the examiner says to start.

- **Task:** Ask the child to move the chosen icons from the left to the right boxes. It is not important in which order the child places the boxes. The game consists in cleaning up the toys. There are three things which are not toys, that is the three icons. The child must take them one at a time and put them in the garbage cans.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:** If the child obtains a PS or F, try using an assistive device such as a trackball or the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CPM-5) Moving around in a document using the scroll bar*

- **Preparation:** Choose an icon that, once opened, has drop-down menus and a scroll bar on the right side, for example, the My Computer icon in Windows. More advanced children can use software such as a word processor or navigator. Once this folder has been opened or the software started, it will be used to assess a series of tasks involving screen movement.

- **Tasks:** Ask the child to execute the following user actions:

- Start the software with the appropriate command

Success level: S SE PS F **Observations:**

- Move around in the document using the following methods:
 - a) put the pointer on the scroll button that controls page forwarding, namely the square with a downward-pointing arrow in the bar on the right side. Hold the left mouse button down. Do the same manoeuvre with the button that controls the movement towards the top of the document.
 - b) click the scroll button that indicates the position in the document. Move through the document by holding the left mouse button down and dragging the scroll button downward.
 - c) click on the scroll bar to jump from one place to another or from one page to another.

Success level: S SE PS F **Observations:**

CPM-6) Moving around in drop-down menus*

- **Preparation:** Remain inside the folder (window) or software used in task CPM-5. Make sure that it has drop-down menus. Show the child the third menu at the top of the window and the fifth command of this menu, for example, the command List in the View menu in the My Computer window/folder or the command Full Screen in the View menu in MS Word.

- **Tasks:** Ask the child to do the following user actions using the **left-click**:

Method 1. Point to the third menu, left click, point to the designated, fifth command and left click again. Cancel the command if it results in an operation.

Success level: S SE PS F **Observations:**

Method 2. Redo the preceding task, but this time have the child point to the chosen menu, left click and hold it down, drag it to the identified command and release the button on the command. Cancel the command if it results in an operation.

Success level: S SE PS F **Observations:**

- **Tasks:** Ask the child to do the following user actions using the **right-click**:

Method 1. Make a right-click at a place where no information is showing, point to the last command of the menu that has popped up, then left click. Cancel the command if it results in an operation.

Success level: S SE PS F **Observations:**

Method 2. Right click and hold it down, then drag it to the chosen command and release the button on the command.

- **Success level:** S SE PS F **Observations:**

N.B. The successful completion of these tasks with the right-click is not essential for computer use. This user action permits shortcuts for certain commands that can be accomplished in other ways.

CPM-7) Using windows*

- **Preparation:** Quit the folder or software used for the preceding tasks. In the desktop window, choose an icon that opens a window. The window should cover a quarter of the screen once it is opened. Adjust it if necessary.

- **Tasks:**

- Ask the child to open the indicated window by double-clicking the appropriate button.

Success level: S SE PS F **Observations:**

- Ask the child to move the window in different directions.

Success level: S SE PS F **Observations:**

- Ask the child to make the window bigger or smaller by clicking the appropriate place for this command in the upper corner of the window or in the taskbar.

Success level: S SE PS F **Observations:**

- Ask the child to close the window by clicking the appropriate place for this command in the upper corner of the window.

Success level: S SE PS F **Observations:**

Interpretation of the preliminary tasks: If the child successfully completes the preliminary tasks deemed to be necessary for computer use, move on to the following tasks. If the child obtains a PS or F, you can adjust mouse parameters in the operating system or try another type of mouse or assistive device such as a trackball or Head Mouse. If the child obtains an S or SE with an assistive device or another adjustment, note it in the observations column and keep this device for use in relevant tasks.

10.2.2 Standardized and Timed Tasks Involving Mouse Functions

The three tasks in this section are timed. They can be used to assess a child's performance when using the mouse. The child's results in each task can be compared to determine the effect of practice or the contribution of different assistive devices. The child's results can also be compared with those of the two validation groups if age and other variables are taken into account.

CM-1) Pointing and clicking

- **Preparation:** Set up Transparency C-3 in front of the screen. The desktop window is visible on the screen. Place the other icons so that they do not hinder this manoeuvre.
 - **Task:** Ask the child to use the pointer to follow paths 1 to 4 there and back. The child must click at the start and at the same place for the end. The pointer must be in the centre of the screen before starting. Depending on the child's level, explain that each time he or she sees a piece of cheese; the child must click it so that the mouse can eat the cheese. However, when the child sees a mouse trap, the child must keep the mouse away from it and not touch it. The child must also stay inside the paths on the transparency.
- | | | | | | | |
|-----------|----------------|---|----|----|---|---------------|
| • Path 1: | Success level: | S | SE | PS | F | Observations: |
| Path 2: | Success level: | S | SE | PS | F | Observations: |
| Path 3: | Success level: | S | SE | PS | F | Observations: |
| Path 4: | Success level: | S | SE | PS | F | Observations: |

Length of time total for path 1 to 4: Trial 1 _____ Trial 2 _____
Total success level: Trial 1 S SE PS F Trial 2 S SE PS F
Observations:

- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
With Imp. F. (13)	25.0	18.4	17.2	7.8-61.9	68.8%	Good
With Imp. A. (23)	13.8	11.8	7.6	5.8-40.1	55.1%	Good
Vis. Imp. (22)	11.4	10.5	7.0	4.0-34	61.4%	Mean
5 years old (17)	9.7	9.1	3.8	4.3-16.6	39.5%	Good
6 years old (32)	7.2	6.8	2.1	4.0-12.3	29.3%	
7 years old (29)	6.4	6.2	1.7	3.4-11.2	26.8%	
8 years old (23)	6.0	5.1	2.2	3.3-11.5	37.0%	
9 years old (14)	5.0	4.8	0.9	4.0-7.1	18.3%	

If the time required by the child is ranked among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as the Dragger program or an adjustment of the double-click speed in the operating system. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CM-3) Changing a window's size using the edges and moving it

- **Preparation:** Put Transparency C-5 in front of the screen. Open a window on the desktop. Adjust the size of this window so that it is identical in size to the rectangle inside the window of the house on the left. The window size must be modified from the bottom. The pointer, whose start position is inside the window, must not be moved until the examiner says to start.
- **Task:** Ask the child to change the bottom of the window of the house on the left side so that the window is identical to the window in the house on the right and the two houses look the same. Then move this window into the house on the right. This can all be done by lengthening the bottom edge of the window so that it is the same height as the one drawn on the transparency. It may then be dragged to the house on the right.
- **Length of time:** Trial 1 _____ Trial 2 _____
- **Success level:** Trial 1 S SE PS F Trial 2 S SE PS F
- **Observations:**
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
With Imp. F (7)	23.4	19.7	16.4	8.1-55.7	70.1%	Good
Vis. Imp. (22)	22.8	20.0	17.3	3.0-75.0	75.9%	Weak
5 years old (13)	23.3	16.0	19.4	5.4-72.6	83.4%	Moderate
6 years old (30)	13.7	12.6	7.6	5.5-43.4	55.9%	
7 years old (29)	10.6	9.3	5.7	4.5-30.1	53.9%	
8 years old (23)	8.2	7.4	3.7	3.3-17.9	45.7%	
9 years old (14)	7.1	6.9	1.8	4.8-10.5	25.5%	

If the time required by the child is ranked among the poorest performances, or if the child obtains a PS or F, try using an assistive device such as a trackball mouse, the Dragger program or other mouse emulator. You could also enlarge window border by the command Active window border, in the menu Appearance of the icon Display of the Control panel of Windows. You can then redo this task with the assistive device to check whether the performance is improved. Note: the results of the group with impairments are not available.

CM-4) Dragging and dropping (curved path)

- **Preparation:** Put Transparency C-6 in front of the screen, choose an icon and move it to the start position, which corresponds to word “start”. The pointer must not be moved and must stay in the middle of the screen until the examiner says to start. Place the other icons so that they do not hinder this manoeuvre.
- **Task:** Ask the child to drag the icon along the path from the start position to the arrival, which corresponds to the little square at the end of the path.
- **Success level:** S SE PS F **Observations:**
- **Interpretation:**

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
5 years old (17)	16.9	14.8	6.3	8.2-32.2	37.4%	Moderate
6 years old (32)	15.2	14.5	4.8	8.1-26.2	31.2%	
7 years old (29)	14.0	12.5	5.2	7.9-31.3	37.2%	
8 years old (23)	13.1	12.7	4.2	7.4-22.4	32.1%	
9 years old (14)	13.4	12.8	3.9	7.7-20.2	29.0%	

If the child obtains a PS or F, try using an assistive device such as a trackball or the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks. **N.B.** Curved paths cannot be accomplished with voice recognition software or mouse commands activated through scanning (e.g. Wivik) or Morse code.

CM-5) Dragging and dropping (right-angled path)

- **Preparation:** Put Transparency C-7 in front of the screen, choose an icon and move it to the start position, which corresponds to the word “start”. The pointer must not be moved and must stay in the middle of the screen until the examiner says to start. Place the other icons so that they do not hinder this manoeuvre.
- **Task:** Ask the child to drag the icon along the path. The explanation given to the child is the same as for the preceding task, CM-4, except that, this time, the path is right-angled.

• **Success level:** S SE PS F **Observations:**

Interpretation:

RESULTS	Mean	Median	Std. Dev.	Min.- Max.	Coef. Varia.	Reliability
5 years old (17)	16.3	14.3	8.0	9.6-39.8	49.0%	Moderate
6 years old (32)	16.4	16.3	4.9	8.9-27.2	30.1%	
7 years old (29)	14.0	12.9	4.5	8.5-27.6	32.3%	
8 years old (23)	13.6	12.5	3.9	7.6-21.9	28.9%	
9 years old (14)	14.8	13.2	5.3	8.3-25.3	35.5%	

If the child obtains a PS or F, try using an assistive device such as a trackball, a mouse emulator or the Dragger program. You can then redo this task with the assistive device to check whether the performance is improved. If the assistive device significantly improves the performance, note it in the observations column and keep this device for use in relevant tasks.

CONCLUSION AND ACKNOWLEDMENT

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APPENDIX

LIST OF TASKS

Adult Version

Preliminary Keyboard Tasks

PK-1 Covering the entire keyboard

PK-2 Performing double or triple

Timed Keyboard Tasks

K-1 Alphabet

K-2 Words

K-3 Sentences

K-4 Repeating key

K-5 Holding a key down

K-6 Moving the cursor with the keys

K-7 Text

Preliminary Mouse Tasks

PM-1 Using the mouse

PM-2 Moving in a document using the scroll bar

PM-3 Moving around in drop-down menus

PM-4 Using windows

PM-5 Action combining mouse and keyboard

Timed Mouse Tasks

M-1 Moving and clicking

M-2 Dragging and dropping (curve path)

M-3 Dragging and dropping (right angle path)

M-4 Moving and double-clicking

M-5 Dragging and dropping (repeated action)

M-6 Modifying a window using borders

M-7 Modifying a window using corners

Child Version

Preliminary Keyboard Tasks

CPK-1 Covering the entire keyboard

CPK-2 Performing double keys

CPK-3 Double keys and complex keys

CPK-4 Holding a key down

CPK-5 Repeating a key

CPK-6 Repeating a key and double keys

Timed Keyboard Tasks

CK-1 Moving the cursor with the keys

CK-2 Vowels

CK-3 Alphabet

CK-4 Syllables

CK-5 Words

Preliminary Mouse Tasks

CPM-1 Using the mouse

CPM-2 Dragging and dropping (curve path)

CPM-3 Dragging and dropping (right angle path)

CPM-4 Dragging and dropping (repeated action)

CPM-5 Moving in a document using the scroll bar

CPM-6 Moving around in drop-down menus

CPM-7 Using windows

Timed Mouse Tasks

CM-1 Moving and clicking

CM-2 Moving and double-clicking

CM-3 Modifying a window using borders

CM-4 Dragging and dropping (curve path)

CM-5 Dragging and dropping (right angle path)

Table 1 : Descriptive Results for the Time (in sec.) for each Task and Intraclass Correlation Coefficient (ICC) Value and the Lower Limit of this Coefficient (LL) for the Adult Samples (trial 2 results)

Group with Impairments

(n = number of people who perform the task in this group)

Task	Number	n	Mean	Med.	Min.-Max.	C.v.(%)*	I.C.C.**	L.L.***
Keyboard Tasks								
Alphabet	K-1	40	30.6	23.6	9.0-144.5	85.7	.90	.84
Words	K-2	24	106.9	73.9	22.9-320.5	75.9	.95	.90
Sentences	K-3	24	140.7	88.3	24.3-478.9	90.3	.96	.93
Repeating keys	K-4	39	50.7	30.0	9.4-268.8	108.5	.93	.88
Holding a key down	K-5	36	58.6	39.1	10.6-290.9	89.3	.97	.95
Moving the cursor	K-6	22	50.8	39.5	24.0-178.4	65.9	.90	.80
Text	K-7	9	313.2	292.5	132.6-518.4	40.9	.92	.60
Mouse Tasks								
Pointing and clicking	M-1	37	44.7	34.7	11.8-123.3	68.7	.94	.90
Dragging and dropping (curves)	M-2	18	53.7	38.1	16.2-160.4	66.5	.79	.55
Dragging and dropping (right-angles)	M-3	34	38.2	21.8	9.7-323.0	143.1	.99	.98
Stopping and double-clicking	M-4	39	24.0	16.0	6.7-231.9	146.5	.99	.99
Dragging and dropping (repeated)	M-5	34	41.9	29.7	13.0-307.2	122.5	.98	.97
Changing a window's size (edges)	M-6	35	26.6	19.8	7.5-69.9	68.8	.87	.78
Changing a window's size (corners)	M-7	36	24.1	15.2	5.5-140.0	105.6	.91	.85

Group without impairments

ICC and LL of this group are those of the French sample (n=19)

Task	Number	n	Mean	Med.	Min.-Max.	C.v.(%)*	I.C.C.**	L.L.***
Keyboard Tasks								
Alphabet	K-1	49	13.9	11.8	5.8-43.0	43.5	.80	.57
Words	K-2	29	40.4	31.6	20.7-103.0	54.0	.90	.73
Sentences	K-3	30	39.1	31.2	16.1-121.6	68.5	.94	.88
Repeating keys	K-4	49	15.5	14.1	6.1-42.9	40.3	.88	.70
Holding a key down	K-5	49	28.0	24.1	15.1-91.3	49.8	.61	.23
Moving the cursor	K-6	30	30.8	28.2	18.4-72.5	34.4		
Text	K-7	26	212.2	188.6	133.0-380.2	32.8	.92	.80
Mouse Tasks								
Pointing and clicking	M-1	49	25.4	19.4	8.1-171.6	103.9	.64	.36
Dragging and dropping (curves)	M-2	30	33.0	26.7	12.1-199.9	101.2		
Dragging and dropping (right-angles)	M-3	49	17.1	14.5	7.2-62.6	57.7	.84	.48
Stopping and double-clicking	M-4	49	9.2	8.3	4.2-22.9	40.1	.77	.56
Dragging and dropping (repeated)	M-5	49	16.1	14.3	8.2-42.2	36.9	.77	.49
Changing a window's size (edges)	M-6	49	13.8	11.2	5.8-40.3	54.9	.50	.13
Changing a window's size (corners)	M-7	49	8.6	7.4	3.4-29.9	56.2	.70	.41

* = coefficient of variation (standard deviation/mean X 100)

** = intraclass correlation coefficient

*** = lower limit of the confidence interval of the intraclass correlation coefficient

Table 2: Descriptive Results for the Time (in sec.) for each Task and Intraclass Correlation Coefficient (ICC) Value and the Lower Limit of this Coefficient (LL) for the Child Samples (trial 2 results)

French Speaking Group with Motor Impairments

Tasks		(n = number of children who perform the task in this group)						
Keyboard Tasks	Number	n	Mean	Median	Min.-Max.	C.V.(%)*	I.C.C.**	L.I.***
Moving the cursor	CK-1	17	45.4	35.1	11.6-142.4	68.5	.87	.71
Vowels	CK-2	15	55.3	49.5	16.0-152.5	63.3	.86	.68
Alphabet	CK-3	9	97.4	57.5	33.2-215.1	68.4	.92	.74
Mouse Tasks								
Pointing and clicking	CM-1	14	55.1	56.7	16.0-100.7	51.3	.93	.82
Stopping and double-clicking	CM-2	13	25.0	18.4	7.8-61.9	68.8	.85	.66
Changing a window's size (edges)	CM-3	18	15.9	13.5	5.5-43.6	61.0	.92	.68

English Speaking Group With Motor Impairments

Keyboard Tasks	Number	n	Mean	Median	Min.-Max.	C.V.(%)*	I.C.C.**	L.I.***
Moving the cursor	CK-1	20	70.1	55.8	30.4-175.3	49.4	.83	.65
Vowels	CK-2	24	23.2	16.2	5.5-80.6	88.8	.82	.66
Alphabet	CK-3	23	75.1	62.2	15.9-201.0	71.4	.88	.76
Mouse Tasks								
Pointing and clicking	CM-1	19	36.1	37.6	12.2-57.2	37.4	.92	.83
Stopping and double-clicking	CM-2	23	13.8	11.8	5.8-40.1	55.1	.90	.79

Keyboard Tasks

French Speaking Group with Visual Impairments

Keyboard Tasks	Number	n	Mean	Median	Min.-Max.	C.V.(%)*	I.C.C.**	L.I.***
Moving the cursor	CK-1	22	46.7	35.0	15-128	60.6	.80	.62
Vowels	CK-2	20	49.3	45	14-183	76.3	.96	.90
Alphabet	CK-3	18	87.1	53	23-43	97.2	.91	.79
Mouse Tasks								
Pointing and clicking	CM-1	21	41.6	31	10-173	88.9	.54	.22
Stopping and double-clicking	CM-2	22	11.4	10.5	4.0-34	61.4	.69	.44
Changing a window's size (edges)	CM-3	22	22.8	20	3.0-75	75.9	.31	-.04

French Group without Impairments

Keyboard Tasks	Number	n	Mean	Median	Min.-Max.	C.V.(%)*	I.C.C.**	L.I.***
Moving the cursor	CK-1	21	24.4	19.8	15.8-61.1	49.6	.68	.38
Vowels	CK-2	21	25.0	22.6	9.5-54.7	50.9	.66	.40
Alphabet	CK-3	17	47.1	40.1	21.0-121.0	55.4	.54	.20
Mouse Tasks								
Pointing and clicking	CM-1	21	25.8	21.7	9.7-67.9	62.4	.79	.57
Stopping and double-clicking	CM-2	21	9.9	9.1	4.8-18.9	39.4	.70	.45
Changing a window's size (edges)	CM-3	18	15.9	13.5	5.5-43.6	61.0	.80	.56

* = coefficient of variation (standard deviation/mean X 100)

** = Intraclass correlation coefficient

*** = Lower limit of the confident interval of the intraclass correlation coefficient

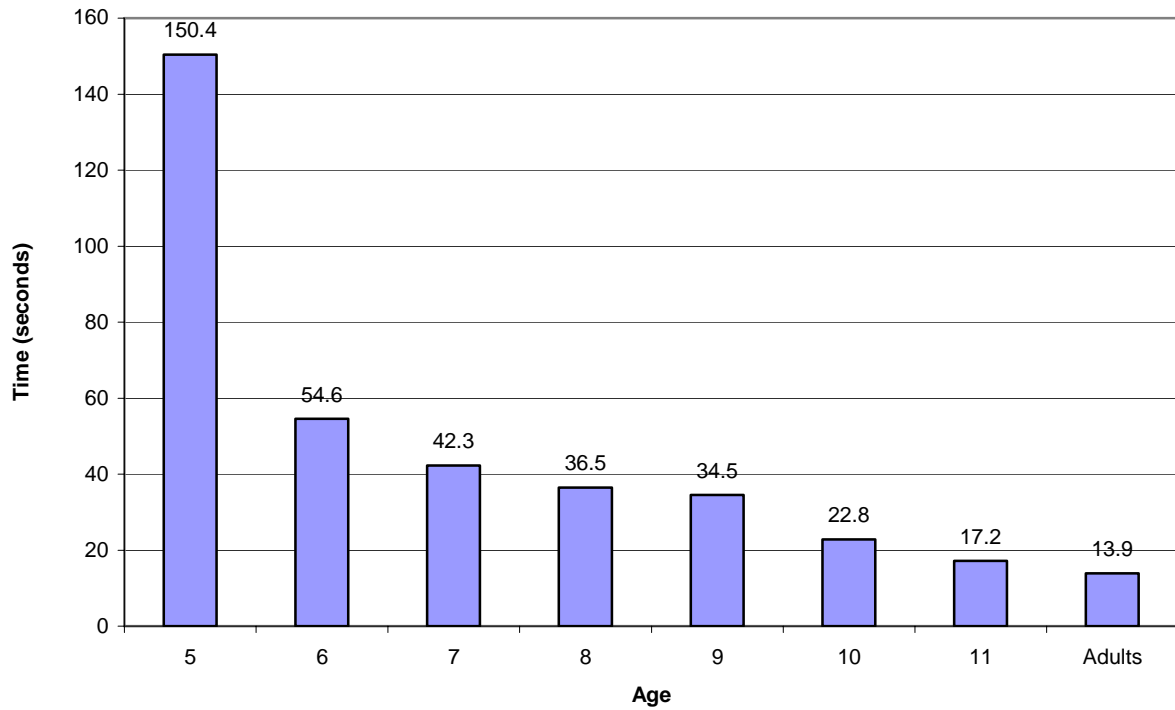
Table 3 : Results for 10 and 11 Years Old Children (n=40) (seconds)

Task	Mean	Median	Standard deviation	Range	Minimum	Maximum	C. v. (%)
K-1	19.81	16.89	7.84	33.08	10.13	43.21	39.58
K-4	20.26	18.67	5.93	23.67	12.91	36.58	29.27
K-6	29.38	29.92	7.63	34.52	16.83	51.34	25.97
M-1	11.69	11.49	3.15	14.60	6.79	21.39	26.95
M-2	11.64	11.47	3.19	13.34	6.78	20.11	27.41
M-3	8.88	8.65	2.31	10.32	5.91	16.22	26.01
M-4	6.37	6.30	1.40	5.67	3.96	9.63	21.98
M-5	12.52	11.54	3.49	15.96	7.64	23.60	27.88
M-6	8.61	8.34	2.19	9.69	5.81	15.50	25.44
M-7	5.85	5.46	1.97	10.87	3.21	14.08	33.68

Table 4 : Mean of Tasks for Adults and Children (seconds)

Task	10 years old (n = 19)	11 years old (n = 21)	Adults	
			N	time
K-1	22.76	17.15	49	13.9
K-4	23.29	17.52	49	15.5
K-6	29.69	29.10	30	21.6
M-1	11.08	12.25	49	25.4
M-2	11.17	12.07	30	33.0
M-3	8.54	9.18	49	17.1
M-4	6.66	6.11	49	9.2
M-5	13.31	11.80	49	16.1
M-6	9.01	8.26	49	13.8
M-7	6.19	5.54	49	8.6

Figure 1 : Mean Values (in sec.) for the Task Alphabet (CK-3 and K-1) in Relation with Age (child and adult test)



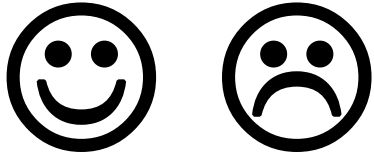
Data

Âge	n	Mean
5	7	150.42
6	13	54.57
7	27	42.26
8	23	36.46
9	14	34.47
10	19	22.76
11	21	17.15
Adults	49	13.9

Model 5

*** I must write a text about the zoo “X” and believe me it is not easy! There are rare words like *wapiti* & *koala*. In addition, I must write the cage numbers to indicate where the animals are: for example #36\54 or #29|07 and I must explain the rates (-10% for people younger than 8 years old; adults = 6\$ + taxes if < 65 years old and 5\$ + taxes if > 65 years old). Could you help me?**

Model P-1



Model P-2



Model C-1

par ten mis

PAR TEN MIS

Model C-2

brave date accent radio taxi