Apparatus for collecting and sending information for the generation of reports, particularly for patients suffering from mental disabilities, comprising processing means, input/output and circuitry means having the peculiarity of comprising: means for generating a plurality of information selectable by these patients; means for storing, on the basis of such selection, given data associated with such selection; and means able to collect and send said information to a remote server able to generate reports about said patient. The invention also relates to a system in which such apparatus is used.
System and apparatus for the collection of statistical information and generation of diagnostic reports for patients suffering from mental disabilities.

DESCRIPTION

The present invention relates to the field of diagnostics, in particular to an apparatus and a system for generating reports for patients suffering from mental disabilities, such as autism.

Autism is a neurological disorder that can disrupt the normal functioning of the brain and heavily influence the possibilities of social interaction and communication skills of patients who are affected.

Typically, the patient with autism has the loss of contact with reality and the construction of an inner life of its own, which is prefixed to reality. Often this syndrome occurs in the first years of life of the subject, and is manifested by profound detachment from the environment (but with intense emotional reactions to changes in this), repetitive, monotonous motion
behaviors, indifferent to usual pampers, absent language or otherwise without communicative value.

The treatment and diagnosis of patients often require specific actions performed by the seat of a specialist.

From the state of the art cognitive media exist, such as communication tables, of which the patient may benefit. These cognitive supports must be early provided, in order to increase the level of language learning and make the most of the useful period for learning the language of the child. However, such media do not allow to monitor in a precise and continuous manner the progress of the patient. Nevertheless, tutors assisting the patients are often required to remember and report the activities of the patient who in turn is submitted to diagnostic investigations. Furthermore, it is always necessary to accompany the patient at the seat of the specialist, who then determines what to do based on the information provided.

Such collection of information, so-called patients' file, must be maintained and updated by a specialist in
such a state that it can be used by third parties. However, not always such information is kept with the precision and the required order, thus making difficult the handover or in some cases even simple consultation to another specialist.

Another problem is due to the fact that the treatment given to the patient must be kept updated, by promptly adapting the same to any possible stimuli and neurological developments of the patient. However, the inevitable delays occurring between one visit and another often do not permit to reach such aim.

Another problem of the prior art systems, is due to the fact that the reports generated by the specialist about the state of the patient are not differentiated on the basis of the audience to which they are destined. This differentiation is important as a report for a group of specialists must certainly be more articulated and complete with respect to a report intended for example to the family.

Main task of the present invention is to overcome the limitations of the known art highlighted above,
proposing a new system capable of performing diagnosis based on elaborations of data individually supplied by a patient.

Within this task, aim of the present invention is to perform the screening of the communication of a patient suffering from mental disabilities, such as for example autism, in which for the screening of the communication the strategy is meant of a diagnostic investigation generalized and suitable for identification of the strengths and weaknesses, as well as the development over time of the communication skills of a patient suffering from mental disabilities.

Another task of the present invention is to provide a multimedia apparatus, usable by a patient suffering from autism or other mental disabilities.

This task and these and other objects that will become clearer hereinafter, are achieved by an apparatus according to claim 1.

This task and these and other objects are also achieved by a system according to claim 7.
This task and these and other objects are also achieved by a method according to claim 11.

Advantageously, the system according to the present invention allows to perform diagnostic remote interventions.

Suitably, the system according to the present invention allows to generate reports modulated on the basis of requirements of users to which it is destined.

Preferably, the apparatus includes means which are readily available on the market.

Advantageously, the apparatus allows to improve the expressive capacity of the patient.

Further characteristics and advantages of the present invention will become clearer from the following detailed description, given as an illustrative and non limiting example, accompanied by the relevant figures in which:

Figure 1 is a block diagram illustrating an embodiment of the system according to the present invention;
Figure 2 shows an embodiment of a apparatus, in particular the corresponding graphic interface, used in the system of Figure 1;

Figures 3 and 3a show two statistic graphs relating to the system of Figure 1 which represent, respectively, the frequency of use of symbols in the various thematic tables, and the frequency of use of a word or a symbol appearing in each of the three sub-areas of a thematic table, every day.

The exemplary structure of the system which is subject of the present invention is summarized in the block diagram of figure 1.

Figure 1 shows a plurality of apparatuses 1, 1'', 1''', a plurality of remote devices 2, 2', 2'', and a remote server 3. Such elements are interconnected through a communication network 4, preferably Internet. In particular the apparatus 1, 1', 1''' is available to a patient suffering from mental disabilities, such as for example an autistic child. The device 2, 2', 2'' is instead available to a medical specialist having the skills to treat a patient who uses the apparatus 1, 1',
The remote server 3 is controlled by an administrator.

The apparatus 1, 1'', 1''' is a compact electronic device provided with processing capability and a display touch screen. In the preferred embodiment of the apparatus 1, 1'', 1''' it is made by a tablet commercially available. The apparatus 1 is made in such a way as to be used efficiently even by patients suffering from mental disabilities, such as an autism, and is provided with all necessary means to consent the patient to receive visual stimuli and interact with them. In the following, for descriptive requirements and merely exemplary purposes reference is made to apparatus 1, assuming that it is realized by means of a tablet. The tablet 1 is obviously able to perform various applications and is provided with networking with Internet. In particular, the tablet 1 permits to perform dedicated software application, the characteristics of which will be explained below, and is provided with Internet-networking. In a preferred embodiment the tablet 1 is dedicated, i.e. it is able to perform only such dedicated software application and to
connect only and exclusively to one of the devices 2, 2', 2'' associated in a manner which will be clarified below.

To better appreciate the tablet 1, reference is now made to Figure 2 which shows a graphical interface displayed on the screen of the tablet 1 generated by the dedicated software application. Such interface essentially comprises a screen consisting of a table containing a series of symbols preferably accompanied by a text description and which are selectable by users.

Such symbols comprise for example expressions associated with moods or feelings ("Enough", "More", "Please", "Help me", "Good", "Not good"), actions ("To will", "To go, "To eat") or objects (such as "Apple", "Ice Cream", "Pizza", "Bath", "Home", "School") and are selected by the patient typically in response to his need or mood. By consecutively pushing such symbols (such as "Will" and "Pizza") this can form, in a manner explained below and according to criteria established by the specialist, a sentence. The symbols presented on a screen can be divided into sub-areas, each relating to an expressive category, each sub-area being delimited and characterized
for example by a color, as in Figure 2 or where the first two columns on the left are marked with the color red (moods or feelings), other three symbols at the top with the color green (actions) and the remaining symbols with the color gray (objects).

In the following, with the term of thematic table reference is made to a set of symbols, possibly organized in sub-areas, present on a screen and selectable by the patient. The set of thematic tables which can be activated on the tablet 1 is provided by the specialist owner of the associated device 2, 2', 2'', said specialist treating the patient making use of the tablet 1.

The pressure of the symbols, as well as the information associated to such pressure, are stored in a database contained in the tablet 1, which is maintained constantly updated. The database contains, for example, the list of symbols pressed by the patient and additional information, such as the instant in which such symbol has been selected and the number of times in which it has been selected. The content of the database is sent in an
appropriate manner for example at regular time intervals or by reaching of a determined amount of data collected, to a remote device 2, 2', 2'' controlled by the specialist. In particular, the dedicated application checks for availability of access to the Internet 3 of the tablet 1 and the ability to reach the device 2, 2', 2'' (such access could be impossible or prohibited under certain conditions) and sends the content of the database to the device 2, 2', 2'' as soon as such access is available. Such content can be viewed, according to appropriate procedures, such as graphs, histograms, areograms representing in a synthetic way the data collected on the tablet 1, 1', 1''. An example of such statistical graphs is shown in Figure 3 and 3a. Preferably the tablet permits to view a report, for example indexed on the basis of thematic tables present on the device associated with the selection of symbols. Such configuration is provided and maintained updated through instructions provided by the remote device 2, 2', 2'' of the specialist.
Returning to Figure 1, the remote server 3 is accessed through the apparatus 1, 1', 1'' and the remote devices 2, 2', 2''. The remote server 3 hosts a website through which the register the patient and the choice of the specialist can be made. The registration steps are performed by a tutor user, for example a family member of the patient. As a preliminary step, the tutor user creates on the remote server 3 an account associated to the patient containing information, such as for example his master data (name, surname, sex, date of birth). Once having performed the registration phase with consequent attribution of credentials, the tutor user can make the "login". Once logged in, the tutor can access a restricted area where a screen is displayed, containing the identity of the patient, a screen associated with the tutors of the patient (filled at registration) and another screen containing a list of the specialists, provided for example by a third party or independently by the specialists interested in the system according to the present invention.
The tutor user can then select from this last list, preferably indexed according to certain criteria (such as name and surname), an authorized specialist provided with the remote device 2, 2', 2''. Once performed such selection, the selected specialist responds by accepting or declining the request for assistance sent by the tutor. If he accepts, the specialist is appointed to assist the patient and then the tablet 1 of the patient is associated with the device 2 of the specialist. From this moment on, the specialist can send configuration instructions to the tablet 1 of the patient. Such setup instructions contain for example thematic tables activated on the tablet 1 of the patient. The tutor user, who assists the patient, can then select a thematic table, preferably detected with a descriptive text ("History", "Matthew", "School") applicable to an activity performed by the patient. For example, if the patient is in school, the area "School" of the table will be selected, and on the tablet 1 the symbols are shown which are associated with such thematic table.
The remote server 3 is also accessible by the device 2, 2', 2'' of the specialist, who can access the restricted area associated with one of his own patients and can create, manage, block remote configurations without having to physically meet the patient. All this is stored in the remote server 3 so making the handover comfortable. In the event that a new specialist owner of the device 2' succeeds the old specialist owner of the device 2, to the new specialist the permission is given to access the restricted area of the patient owner of the tablet 1, so that he has immediately available the diagnostic reports of the patient and the activities carried out with the use of the tablet 1. In this way the entire intervention played at the moment of the transition will not be lost, but may be associated with the new physician/specialist.

The device 2, 2', 2'' is essentially a computer with connectivity. The remote device 2, 2', 2'' is associated with a particular specialist physician and is connected through the Internet 3 to the tablet 1, 1', 1'' of its own patients. In particular, the device 2, 2', 2'' can only
communicate with the tablet 1, 1', 1'' of the patients from which has been commissioned to carry out the activity of administration of diagnostic interventions. Hereafter due to descriptive requirements it will be assumed that the specialist owner of the device 2 is treating the patient which uses the tablet 1.

The device 2 has a first configuration functionality of the tablet 1 through transmission of instructions. Such instructions essentially contain the thematic tables and the reports viewed on the tablet 1 itself. Indeed, through such device 2 the specialist can create the thematic tables associated to the patient and used by the same.

The device 2 sends, at given intervals, such instructions also including the thematic tables to the user owner of the tablet 1. Such instructions also contain commands which allow a tutor user, such as a patient's family member, to create thematic tables, to display information related to the tables (publication date, situation and examples of the works, blocked publication date, name of source) or to the statistical reports. In
other words, the specialist can adapt, based on the needs of the patient and the needs of the tutor user, the functionalities which can be activated on the tablet 1, 1', 1''.

The device 2 also has a second functionality which consists in the generation of statistical reports based on the content of the database received from the tablet 1. Such content essentially comprises the symbol selected by the patient (such as "Mom"), the date of selection (for example "24.03.2014 at 15:02:07") and the delay, that is the time elapsed since the selection of the symbol with respect to the previous one. Based on such data, the specialist can make his own deductions. In particular the specialist, for each thematic table can identify a set of symbols associated to a sentence. By implementing a process called "chunking", the specialist groups the selected symbols in a given period of time and determines whether they can be considered as a sentence made by the patient. For example, in a time interval, the patient could select the symbols "Mom", "Enough", "Again", "Don't like", "Again", "Enough", "Change Clothes", "Change
Clothes", "Change Clothes" "Argue". If the specialist has determined that these symbols are all linked to a sentence, the device 2 shows, through a dedicated interface and with appropriate graphics modes, the details on the composition of the sentence or the timing of the composition of the single word (or by pressing the symbol associated with the word) with respect to the previous word. Preferably the statistical reports are shown as graphs.

The device 2 also allows, for each thematic table, to display the symbol most commonly used on a certain day. If necessary, such display may in turn be indexed on the basis of the sub-areas of a given thematic table. The device 2 also permits to display the frequency of use of symbols in the different configurations or thematic tables. The device 2 permits, for each symbol, to view additional details, such as the name of the symbol, the number of times that it is used, the date of last use and frequency of use of the symbol, in the different thematic areas.
Figure 3 shows an example of a graph associated with a diagnostic report. In particular, on the axis of the abscissa axis the symbol selected by the patient of the tablet 1 is indicated, whereas on the axis of the ordinate the number of times is indicated, in which such symbol has been selected.

Figure 3a shows a second example of a graph associated with a diagnostic report. In this report it is supposed that the symbols on the tablet 1 have been divided into three areas, each represented by a rectangle. In particular on the axis of the abscissa a certain date is indicated, whereas on the axis of the ordinate the number of times is indicated, in which such area has been selected. Obviously such graphs are by way of example, and many others can be generated on the basis of the data provided by the tablet 1 and of the criteria chosen by the specialist (based for example on proprietary algorithms).

It has thus been shown that the system and the apparatus described achieve the intended aim and the intended purposes. In particular, it was seen how the
system thus conceived allows to overcome the qualitative limits of the known art, by allowing to essentially perform, through the use of a tablet for the collection of information and for access to a restricted area placed on a remote server, the screening of the patient communication. This is achieved through processing of statistics data and metrics of use of data as well as the management and the use of data related to the activity of the monitored patient. All symbols typed from the patient are stored locally on the tablet. At the same time, the tablet downloads any new available configuration. Similarly, the system according to the present invention allows to remotely supply interventions through an Internet connection. The specialist can produce reports and make the diagnoses through metrics (or, the analysis of the symbols selected by the user) which after a proper processing allow for the advanced and evolved screening of the communication. The metrics available are varied such as the metric "Use of symbols" that gives a chance to view the use of symbols divided by configuration or "Detail of used symbols" that gives a chance to view the
names of the symbols, the number of uses for single symbol, and the last use of each symbol. In this way, the system allows to generate either reports used by the patient's tutors, such as the family of the patient, or more detailed reports for medical use. The reports can have various uses, such as a support for the organization of work teams involving, for example, teachers or social cooperatives which follow the patient at school.

Clearly, many modifications are evident and can be promptly performed by the expert in the art without departing from the scope of protection of the present invention.

Therefore, the field of protection of the claims must not be limited by the illustrations or by the preferred embodiments illustrated in the description in form of examples, but rather the claims must comprise all the characteristics of patentable novelty residing in the present invention, including all the features that would be treated as equivalents by the expert in the art.
CLAIMS

1. Apparatus (1, 1', 1'”) for the generation of diagnostic reports and the improvement of communicative skills of patients suffering from mental disabilities including processing means, input/output means and circuitry, characterized by further comprising:
- means for selecting an information from a patient using said apparatus (1, 1', 1'”);
- means for storing given data associated with said selected information;
- means apt to collect and send said stored data to a remote device (2, 2', 2'”) apt to generate diagnostic reports based on said data;
- means for receiving from said remote device (2, 2', 2'”) said diagnostic reports and an updated set of selectable information.

2. Apparatus (1, 1', 1'”) according to claim 1, characterized in that it comprises a tablet with a display touch screen; said apparatus being further characterized in that said information is associated to a selectable symbol and comprising an image and a text description,
said selection comprising the touch of said display by said patient.

3. Apparatus (1, 1', 1'') according to one or more preceding claims, characterized in that it comprises means apt to detect the connectivity to a communications network (4) and means for sending to a remote device (2, 2', 2'') said data, on the basis of the detection of said connectivity.

4. Apparatus (1, 1', 1'') according to one or more preceding claims, characterized in that said information comprises symbols associated to a state of mind, to an action or an object, said symbols being organized in thematic tables selected from a visual menu.

5. Apparatus (1, 1', 1'') according to one or more preceding claims, characterized in that it comprises means for receiving from said remote device (2, 2', 2'') instructions, said instructions comprising an authorization for configuring said apparatus by a user utilizing said apparatus.

6. Apparatus (1, 1', 1'') according to one or more preceding claims, characterized in that it visualizes the
reports received from said remote device \((2, 2', 2^{11})\), said reports comprising information related to the number of times said symbol has been selected, the date of use of such symbols, the date associated with the last use of each of said symbols, or a set of symbols.

7. A system for diagnosis and supply of remote interventions based on the collection of information related to patients suffering from mental disabilities including:

- at least one apparatus \((1, 1', 1'')\) according to claims 1 to 6, controlled by one of said patients, said apparatus being apt to provide data which can be processed for the generation of diagnostic reports;
- at least one remote device \((2, 2', 2'')\) configured to process said data received from said at least one apparatus \((1, 1', 1'')\);
- a remote server \((3)\) comprising, for each of said patients provided with one of said at least one apparatus \((1, 1', 1'')\), a reserved area accessible by means of credentials; said server \((3)\) being apt to receive from said apparatus \((1, 1', 1'')\) instructions for the
selection of at least one user owner of said remote
device (2, 2', 2'') and means for associating said at
least one apparatus (1, 1', 1'') to said at least one
remote device d (2, 2', 2'');

5 - a communication network (4) apt to interconnect said at
least one apparatus (1, 1', 1''), said at least one
remote device (2, 2', 2'') and said remote server (3).

8. System in accordance with claim 7, characterized in
that said at least one remote device (2, 2', 2'')
comprises means for sending instructions destined for
said at least one apparatus (1, 1', 1''), said
instructions comprising a set of symbols selectable by
said patient through said at least one apparatus (1, 1',
1'').

9. System in accordance with at least one of claims 7 or
8, characterized in that said processing of said data
comprises the generation of diagnostic reports, said
reports being represented in the form of graphics
displayed on said apparatus and on at least one remote
device (2, 2', 2'').
10. System in accordance with at least one of claims 7 to 9, characterized in that said remote server (3) further comprises means for receiving a request of association of said at least one apparatus (1, 1', 1'') with said at least one remote device (2, 2', 2''); means for forwarding said request to said user owner of said at least one remote device (2, 2', 2''); means for performing said association on the basis of the acceptance of such request by the owner of said user; and said at least one apparatus (1, 1', 1'') being further configured for receiving notifications and configuration instructions by said remote device d (2, 2', 2'') .

11. Method for the generation of diagnostic reports and the improvement of communication skills of patients suffering from mental disabilities, characterized in that it comprises the steps of:
- providing means for selecting a set of information by a patient user of an apparatus (1, 1', 1'');
- providing means for storing, on the basis of such selection, data associated with such selection;
- providing means apt to collect and send said stored data to a remote device (2, 2', 2'') apt to generate diagnostic reports based on said data;
- providing means for receiving from said remote device (2, 2', 2'') said diagnostic reports and an updated set of selected information.
Fig. 3

Fig. 3a
A. CLASSIFICATION OF SUBJECT MATTER

G06F19/00  G06F3/048  G09B5/00

According to International Patent Classification (IPC), or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F  G06Q  A61B  G09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, BIOSIS, EMBASE, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. See patent family annex.

Special categories of cited documents:

*A* document defining the general state of the art which is not considered to be of particular relevance

**E** earlier application or patent but published on or after the international filing date

**L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

**O** document referring to an oral disclosure, use, exhibition or other means

**P** document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered without the document or the invention cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered without the document or the invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"A" document member of the same patent family

Date of the actual completion of the international search: 30 July 2015

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Name and mailing address of the ISA/

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Authorized officer

Itoafa, Alex
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