



A Computer Art Therapy System for Kinetic Family Drawing (CATS.KFD)

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ABSTRACT

This study delineates the development of the Computer Art Therapy System for the Kinetic Family Drawing (CATS.KFD) which uses given patterns instead of free drawings. The CATS.KFD consists of four stages. The system provides clients with questionnaires on their family relationships and color preferences, and their answers constitute a fact base. The system provides the client with various patterns of family members and backgrounds which possibly compose a KFD, and the client selects a few among them; manages, expands, or contracts; and colors them. The system evaluates elements and detects changes of evaluations in the KFDs, and this evaluation and detection of changes also constitute the fact base. The system interprets one or several KFDs by invoking the knowledge in a knowledge base corresponding to the facts in the fact base. The knowledge base, which consists of knowledge related to the KFD is continuously accumulated and updated. The system automatically provides art therapists not only with an objective evaluation of the elements, but also with information about their client's psychological status and treatment process. It is expected that the CATS.KFD with patterns would inherit and complement the validity of the traditional KFD with free drawings.

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Introduction

This study delineates the development of the Computer Art Therapy System (CATS) which operates in real-time via the internet for the Kinetic Family Drawing (KFD) developed by Burns and Kaufman (1972). We designate the system as the CATS.KFD. First of all, it should be admitted that this study does not use KFDs that are freely drawn, but only KFDs that are composed of given patterns. Despite the remarkable progress of computer technology, at present, the computer is unable to identify forms in free drawing and, thus, the actions of forms and the spatial relationships among them. Thus, for the system to identify the subjects in a drawing, the system prepares in advance various kinds of patterns of family members and backgrounds which will possibly compose a KFD, and provides them to the client, and the client selects a few among them; arranges, expands or contracts; and colors them. Then, by inbuilt functions of the computer and some existing CATSs for art assessments, the system can identify the forms and evaluate the placement, size, distances between forms, and various other elements.

We examined all of the elements which are possibly considered for evaluation in the KFD as much as we can in various literature, including Burns and Kaufman (1972), McPhee and Wegner

(1976), Myers (1978), Reynolds (1978), elements in the Descriptive Assessment of Psychiatric Artwork (Hacking, 1999), the Diagnostic Drawing Series (DDS) (Cohen, 1986/1994), the Person Picking an Apple from a Tree (PPAT) (Gantt, 1990), the Computer Color Related Elements Art Therapy Evaluation System (C.CREATES) (Kim, Bae, & Lee, 2007), and structured mandala (Kim, Kang, & Kim, 2009). After consolidating those elements which were the same but with different names, we found that there were 127 elements. For the evaluation of these elements, there are many positive reports/papers showing high inter-rater reliability. Mostkoff and Lazarus (1983) mentioned the possibility of creating an objective evaluation system, and McPhee and Wegner (1976), Cummings (1980), and Elin and Nucho (1979) reported high inter-rater reliability. However, some elements have to be evaluated by the human rater's intuition, judgment, and subjective determination and, thus, some inconsistencies are inevitable. Even for some elements using certain selected objective criteria, such as rulers or grids made of tracing paper marked off in millimeters, this process is time consuming and there still remains some inaccuracy.

Several CATSs have been developed for art assessment which provide absolute reliability in the evaluation of some elements in drawings, viz. the CATSs for the evaluation of color-related elements, C.CREATES (Kim, Bae, et al., 2007), determination of placement (Kim, Kang, & Kim, 2008), judgment of main color (Kim, 2008), evaluation of variety of color (Kim & Hameed, 2009), and evaluation of elements in structured mandala (Kim, Kang, et al., 2009). By employing these computer systems and inbuilt functions

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of the computer, the CATS.KFD can automatically, accurately, precisely, quantitatively, and objectively evaluate the 127 elements in the CATS.KFD, thus achieving absolute consistency in its assessment.

As a subject of the CATS, we chose the KFD developed by Burns and Kaufman (1972), since it is one of the most widely used art therapy tools and its reliability and validity have been proven. We expect the CATS.KFD with given patterns to inherit the applicability, usefulness, and validity of the traditional KFD with free drawings. Burns and Kaufman argued that the KFD reflects emotional disorders faster than other methods do and offers art therapists information not only about the adaptive and defensive functions of children, but also about their family dynamics. There are plenty of literatures reporting the validity of the KFD in applying it for various purposes. For example, the KFD recognized cases of child abuse or neglect, or distinguished children who are suffering from child abuse or neglect from normal children in the studies of Schornstein and Derr (1978), Hackbarth, Murphy, and McQuary (1991), Reddy, Bhadramani, and Samiullah (2002), and Veltman and Browne (2003). We omit its validity in other applications.

On the other hand, it is well known that while many studies found positive results using the KFD, other studies were not as confident of its validity. Cummings (1980) suggested that KFDs may be sensitive to the transition in children's personality states and Mostkoff and Lazarus (1983) asserted that the KFD is sensitive to children's mood changes, and therefore it may not be an accurate measure of personality traits or characteristics. There are even some studies reporting contradictory results. Monahan (1986) noted that more psychological symptoms are found in the KFDs of high-achieving children than those of lower-achieving children. Their results failed to support the hypotheses of Burns and Kaufman (1972), who used the KFD to determine the extent of a child's adjustment. We omit other studies reporting questionable validity or contradictory results. For this problem, we expect that the CATS.KFD could be a helpful tool as an experiment for the validity of knowledge, which will be discussed in the later section of discussion and conclusion.

The CATS.KFD consists of four stages. In the first stage of the questionnaires, in order to obtain information about the client's environment and history, which cannot be obtained from drawings, the system in this study provides two questionnaires regarding the client's family relationships and color preferences, whose answers constitute a fact base (FB). In the second stage of KFD composition and coloring, the client selects a few among various given patterns, arranges, rotates, expands or contracts, and colors them. In the third stage of analysis and evaluation of the elements in the composed KFD, the system evaluates the elements in a KFD or detects changes of evaluation in several KFDs by using inbuilt functions of the computer and some existing CATSs for art assessments. The results of the evaluation and detection of changes also constitute an FB. In the final stage of interpretation, the system provides information about the client's psychological status or treatment process by invoking the knowledge in the knowledge base (KB) corresponding to the facts in the FB. The KB, which consists of the expertise and experience of experts and literatures, is continuously accumulated and updated.

The system developed so far is currently only a prototype model. However, all of the features have been designed. The procedure of the CATS.KFD that is operated in real-time on the internet is as follows: The user receives an explanation of how to operate the system, which takes 5–10 min. The system offers questionnaires and receives the user's answers (5–10 min). With appropriate questionnaires, various information about the client's environment and history can be obtained. Depending on the answers, the system offers various types of patterns for each family member and background. The user selects a few among these patterns, arranges

them, and expands or contracts their sizes (15–20 min). In this procedure, the system can evaluate the client's sense of balance. Then, the user colors the patterns on the computer using computer brushes with three thicknesses (20–25 min) or prints the completed KFD with the patterns on an A4-sized paper and then colors them using crayons or markers, makes a file copy by means of a scanner or digital camera, and sends it to the system. In this client's coloring work, the system can evaluate three elements, viz. the degree of concentration, completeness, and accuracy. The system evaluates all of the elements in a KFD or detects changes of evaluations in several KFDs, and then interprets and informs the clients of the results (less than a minute).

The system can provide art therapists with various valuable information about element evaluation such as the number of colors used, the area painted, family members missing, sizes of family members, distances between family members, etc., by evaluating the various elements in the KFDs with patterns. Also, it can aid art therapists in their decision making on a client's psychological status or treatment process by interpreting one or more KFDs. We hope this kind of interdisciplinary work incorporating art therapy and computer science can not only promote the use of various art therapy tools, but also pave the way for the development of new technology for the analysis and application of art therapy, as well as its theoretical understanding.

In the following four sections, the four stages of the CATS.KFD procedure are explained with case examples. In the final section of discussion and conclusion, the contribution of this interdisciplinary study to the field of art therapy and its possibilities are mentioned.

Questionnaires with fact base

In the first stage, the system provides two questionnaires. One is used to obtain information on the client's gender, age, and his or her family relationships (Fig. 1). From the client's answers to this questionnaire, we constitute a questionnaire-related fact base, such as

- (QF1) The client is a 7-year-old girl.
- (QF2) She has parents and one brother.

The other questionnaire (Fig. 2) is used to obtain information on the client's color preferences, such as his or her favorite color, most disliked color, father's preferred color, mother's preferred color, etc. From the client's answers to this questionnaire, we constitute an FB, such as

- (QF3) The client's favorite color is red.
- (QF4) The client's most disliked color is black.
- (QF5) Her father's preferred color is blue.
- (QF6) Her mother's preferred color is green.

Art therapists should be very cautious in interpreting a drawing without knowing the client's background, such as the traditions and behavioral patterns of the society in which he or she grew up. Also, dialogue between the client and art therapists gives important information which can help in interpreting a drawing. Through suitably designed questionnaires, these types of information could be obtained.

Composition and coloring

In the second stage, as can be seen in Fig. 3, the system prepares in advance various kinds of patterns of family members and backgrounds, etc., which will possibly compose a KFD, and provides the client with them. Fig. 3 shows a computer screen on which patterns are provided to a 7-year-old girl who has parents and an elder brother. The screen is divided into 4 windows; the working window which forms the largest part of the screen, the family window on the right, the background window on the lower part of the

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