A statistical approach to comparing the effectiveness of several art therapy tools in estimating the level of a psychological state

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ABSTRACT

An approach using a statistical method has been proposed to compare the effectiveness of several art therapy tools in estimating the level of a psychological state, which includes various symptoms and disorders. For each of the art therapy tools, a regression model is developed, whose dependent variable (to be explained) is the level of a psychological state. Various elements in drawings are considered as independent (explaining) variables, some of which are evaluated by the computer systems for art therapy assessments. A set of independent variables "well" explaining the dependent variable is determined by the stepwise regression. The effectiveness of art therapy tools is analyzed and measured in a comparable quantitative term, and thus can be compared with other tools. In this paper, the approach has been applied to three widely used art therapy tools in estimating the level of dementia. The same method can be adopted as a predictor of a psychological state of an individual.

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Introduction

There are many studies estimating psychological states based on the elements in drawings. For example, Reddy, Bhadramani, and Samiullah (2002) distinguished the differences in the Kinetic Family Drawings (KFD) (Burns & Kaufman, 1972) done by the children who were neglected and the children who were considered to be raised in a normal family setting. The results showed that the drawings differed in the contents of the family members. Children from neglected families were more likely to put the family members 'irregularly' and be 'reluctant' to draw. Louw and Ramkisson (2002) identified sexually abused girls from the House-Tree-Person (HTP) Test (Buck, 1948) and the Draw-a-Person (DAP) Test (Naglieri, 1988), where the sexually abused girls differed significantly on the four scales of the HTP and the DAP, compared to the same age group who did not have any history of sexual abuse. Veltman and Browne (2001) found that the KFD was three times better than the Favorite Kind of Day (FKD) (Manning, 1987) for identifying maltreated children. Kim, Betts, Kim, and Kang (2009) estimated the level and predicted the existence of dementia from the Structured Mandala Coloring (SMC). They found that the level of dementia was related to the accuracy in coloring area given, the number of color clusters generated, and the use of light-green, brown, and green, and that severe dementia was related to the degree of concentration in coloring a structured mandala and the use of brown.

In this study, an approach using a statistical method has been developed to compare the effectiveness of several art therapy tools in estimating the level of a psychological state, including the symptoms and disorders of the child abuse or neglect, sexual abuse, trauma, schizophrenia, dementia, depression, attention deficit, etc. As a statistical method, a multiple linear regression analysis has been adopted, which is a widely used method explaining one variable from the others (Kutner, Nachtsheim, Neter, & Li, 2005). The dependent (to be explained) variable of the model is the level of a psychological state. The level may be scored by the formal tests such as the Mini-Mental State Evaluation (MMSE) (Folstein, Folstein, & McHugh, 1975), the Beck's Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), the Symptom Checklist-90-Revisional (SCL-90-R) (Derogatis, 1977), the Myers–Briggs Type Indicator (MBTI) (Myers & McCaulley, 1985), and the Murphy–Meisgeier Type Indicator for Children (MMTIC) (Murphy & Meisgeier, 1987), or the evaluation from experts such as art therapists and psychologists.

The independent (explaining) variables can be the elements in drawings including ones in the Descriptive Assessment for Psychiatric Art (DAPA) (Hacking, Foreman, & Belcher, 1996), the Diagnostic Drawing Series (DDS) (Cohen, Hammer, & Singer, 1988), the Formal Elements Art Therapy Scale (FEATS) (Gantt & Tabone, 1998), the Face Stimulus Assessment (FSA) (Hamilton, 2008), and

the Computer Color Related Elements Art Therapy Evaluation System (C CREATES) (Kim, 2010; Kim, Bae, & Lee, 2007), such as the number of colors used, space usage, details, accuracy in coloring, etc. Some elements are automatically evaluated by the computer systems for art assessments, which include the C CREATES, the determination of unusual placement (Kim, Kang, & Kim, 2008), the judgment of main color (Kim, 2008), the assessment of completeness and accuracy in coloring a pattern (Kim, Kang, & Kim, 2009), and the rating of the color variety (Kim & Hameed, 2009); others are manually evaluated by art therapists. Among various independent variables, by stepwise regression, some variables "well" explaining the dependent variable are selected. The effectiveness of tools is analyzed via scatter plots and is measured by the coefficient of determination (R^2). Also, the relative importance of selected independent variables is compared by the standardized regression.

As an application and case study of this approach, the effectiveness of three art therapy tools in estimating the level of dementia, the Person Picking an Apple from Tree (PPAT) (Gantt, 1990), the FSA (Betts, 2003), and the SMC, were compared. The samples were collected from 58 persons with suspected dementia in a psychiatric unit, ages ranging from 60 to 90 years old. The level of dementia, a dependent variable of the model, was measured by the Korean version of the MMSE (MMSE-K). A total of 64 elements were considered as the independent variables of the model. These elements came from the DAPA, the DDS, the FEATS, the FSA, and the C CREATES. Some independent variables, such as the number of colors, number of clusters, length of edge, and number of pixel painted, were automatically evaluated by several computer systems, while others, such as the color fit, implied energy, integration, and logic, were manually evaluated by human art therapists.

Many art therapists may struggle to convince other mental health professionals on the effectiveness of art therapy tools. The approach to choose an effective tool and analyze the relationship between the test scores and its estimated values may aid many art therapists who hope to find evidence to support their observations and impressions to official documents. Use of this approach is not to suggest how to diagnose the clients; rather, it is to aid the judgment process for art therapists.

The approach developed in this study is a generalized one, and thus can compare the effectiveness of any special art therapy tools in estimating the levels of various psychological states. Also, the approach can be applied to statistically identify the psychological disorder, which could aid the art therapists' process of evaluating their clients. Additionally, the approach can support the psychological tests for clients with limited ability in speaking, reading, and comprehension.

Approach: regression model

We compare the effectiveness of several art therapy tools in estimating the level of a psychological state based on the evaluations of various elements in drawings. We assume that we are estimating the level of a certain psychological state caused by the disorders, including child abuse or neglect, sexual abuse, trauma, schizophrenia, dementia, depression, and attention deficit disorder, from several art therapy tools including the free drawings, the SMC, the DDS, the PPAT, the HTP, the KFD, the DAP, the FKD, and the FSA. For each art therapy tool, a multiple regression analysis is applied to estimate the level of psychological state (Y, dependent variable) based on the elements (X_j, $j = 1, 2, . . ., k$, independent variables) in the drawings.

In this study, the dependent variable was the level of psychological state. As independent variables, we considered 15 elements in the DAPA, 22 elements in the DDS, 14 elements in the FEATS, 9 elements in the FSA (Hamilton, 2008), and 15 elements in the

C CREATES. Some of the variables overlap, such as the integration in the FEATS and the DDS, the line quality in the FEATS and the DDS, and the space in the FEATS and the DAPA, while some of them are the same elements using different names such as the line length in the DDS and the length of edge in the C CREATES, the representational in DDS and the realism in FEATS, and the space usage in DDS and the space in DAPA. Thus, we actually considered 64 elements. The sample values of the independent variables were evaluated manually by art therapists or automatically by several computer systems for art assessments. Among a total of 64 elements, 15 elements were evaluated automatically by the computer, and the remaining 49 elements were evaluated by human raters. Of course, in the application we excluded elements not appropriate for each of the art therapy tools under consideration, such as the accuracy in the PPAT, the line quality in the SMC, and the rotation in the FSA.

Several elements considered to be important in estimating the level of psychological state were selected by the stepwise regression, and the relative importance of the selected elements was compared via standardized regression. The whole procedure was performed using a statistical package, Statistical Package for the Social Sciences (SPSS). The larger coefficients of independent variables in standardized regression can be interpreted as having the greater relative effect of the independent variable on the dependent variable.

With appropriate test scores for a psychological state and suitable elements in the drawings of art therapy tools under consideration, we can extend the application of this approach to any art therapy tool and any psychological state. We note that the probability of having a certain psychological disorder can be predicted by the same approach of using the regression model (Kim, Betts, et al., 2009). The only difference in this case is that when the dependent variable Y scores below a certain threshold value, it indicates the existence of psychological state. Then, the model can help predict the probability that a client has a specific psychological state.

Case study

In this paper, dementia is chosen as the subject of psychological disorder due to its severity in Korea. Dementia is one of the top public health issues of 21st century (Stewart, 2006). The number of Americans affected by Alzheimer's disease is expected to approach 14 million by 2050 (Cowley, 2000). In 2008, the size of the 65 and older population was 5 million, 10.3% of the whole population (Han, 2008); this number is expected to increase to 10 million in 20 years by 2028, 23.0% of the whole population. Among this age group, the rate of definite dementia was 8.4% in 2008 and is estimated to reach 9.6% in 2028 (Seoul National University Hospital, 2008). Art may allow clients with dementia to experience pleasure from using colors, forms, and textures to express themselves (Stewart, 2006). The drawings can be compared to determine the course of patient treatment (Betts, 2006). The artwork, especially when viewed over time, can assist the staff and family in evaluating the progression of dementia (Stewart, 2004). Couch (1997) states that drawings can indicate thoughts and emotions that patients may be experiencing but unable to express due to the disease process. It can provide order and balance to one whose disordered thoughts, memories, and feelings may be difficult or impossible to access, lost behind the veil of dementia. Therefore, art therapy can invite older adults affected by dementia to freely express their mind and emotions through the nonverbal means of drawing (or the art-making process). Art therapy with dementia patents can be challenging for the art therapist (Couch, 1997).

The approach has been applied to the three widely used art therapy tools, the PPAT, the FSA, and the SMC, in estimating the level of