The Effect of Graded Craft Activities on Visuomotor Integration in an Inpatient Child Psychiatry Population

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Key Words: child • craft analysis • mental disorders • visual perception

The effectiveness of a graded series of craft activities on improving visuomotor skills was tested with an inpatient child psychiatry population. A standardized test of visuomotor integration served as a pretest and posttest to compare two nonconcurrent groups in the same setting. The inpatient program was the same for both groups, except that the treatment group (n = 33) participated in a graded craft sequence, while the control group (n = 24) did not. The frequency and degree of improvement were significantly greater in the treatment group. The degree of improvement in both groups was significantly related to age, IQ, and diagnosis of affective disorder, but not to sex, psychotropic medication, number of treatment sessions, or other diagnoses, including conduct disorder and attention deficit disorder. Mean age and IQ did not differ significantly between the two groups. The study tentatively supports a graded crafts program as a means for the improvement of visuomotor skills, but suggests that further research be done with matched groups.

Literature Review

The literature suggests links between visual perception and psychiatric or behavioral disorders (Flach & Kaplan, 1983; Kaseno, 1985) and between neurological and neuropsychological impairment and child psychiatric disorders (Szatmari & Taylor, 1984; Tramontana & Hooper, 1987). Poor visuomotor function is a recognized factor in learning disabilities in children (Ayres, 1979; Mattison, McIntyre, Curtis, Brown, & Murray, 1986; O'Brien, Cermak, & Murray, 1988). An early study by Llorens (1968) demonstrated the existence of perceptual-motor dysfunction, as defined by Ayres (cited in Llorens, 1968), in hospitalized children with emotional disturbances. No studies relating visuomotor function to childhood mental disorders were found.

Visuomotor skill requires the ability to translate visual perception into motor functioning and involves motor control, motor accuracy, motor coordination, and psychomotor speed (Gardner, 1986). The developmental acquisition of visuomotor skill may be seen as the result of active engagement with the external environment in interactions that become increasingly more purposeful. In early infancy, basic sensory awareness and discrimination, in association with random and reflexive movement, result in the formation of a basic body map that serves as the foundation for visual and motor exploration of the external world. As the child reaches for and grasps objects and engages in more and more refined manipulation of objects, he or she is building the basis for the two-dimensional manipulation of abstract concepts that are required for the advanced cognitive skills of reading and writing (Ayres, 1979; Beery, 1982; Bruininks, 1978; Hayes & Kornick, 1971; Short-DeGraff, 1988). Moran and Kalakian (1974) stated:

Manipulation, the motoric component of visual-perceptual-motor development, is important because there is relative concreteness in the physical manipulation of objects in the environment. The relative concreteness of physically manipulating an object, when coupled with simultaneous visual experiences, facilitates the development of visual impressions about that object. These impressions and judgments simultaneously stemming from seeing and doing provide a major basis for the development of visual-perceptual-motor efficiency. (p. 24)
Purposeful activity, as a core concept in occupational therapy, has been addressed in theoretical papers by King, 1978; Breines, 1984; Gliner, 1985; Dutton, 1989; and Arnsten, 1990. The concept has also been tested in empirical studies in which subjects focused on a goal or a pleasant experience inherent in the activity. When compared with control subjects asked simply to repeat similar motions, the subjects engaged in purposeful activity performed a significantly greater number of repetitions (Maurer, Smith, & Arnetta, 1989; Steinbeck, 1986; Yoder, Nelson, & Smith, 1989), achieved a significantly greater heart rate before perceiving their exertion as very hard (Bloch, Smith, & Nelson, 1989; Kircher, 1984), exhibited a significantly greater tolerance for pain (Heck, 1988), and evaluated the activity more highly as measured by the Osgood Semantic Differential (Miller & Nelson, 1987).

Although Thibodeaux and Ludwig (1988) found no significant differences in heart rate or duration of time before the subjects saw themselves as working hard, those subjects whose sanding produced a cutting board that they could keep reported significantly greater enjoyment of the activity.

Crafts, as one type of purposeful activity, have been a traditional therapeutic modality in occupational therapy (Levine, 1987; Reed, 1986) and are commonplace in child psychiatry programs. The role of crafts in contemporary practice, however, is by no means secure (Barris, Cordero, & Christiaansen, 1986; Bissel & Maliloux, 1981; Eliason & Gohl-Giese, 1979). Barris et al. (1986) suggested that one reason may be the fact that the therapeutic efficacy of craft activities has not yet been adequately demonstrated by research.

Several published studies have attempted to demonstrate empirically the effect of craft activities on a specific patient population. In a pioneering study, Smith, Barrows, and Whitney (1959) described the psychological attributes of crafts as identified by psychiatric, tuberculous, and general medical and surgical patients and by control subjects. Kremer, Nelson, and Duncombe (1984); Chun and Davidson (1987); and Boyer, Colman, Levy, and Manoly (1989) examined responses to selected activities, including crafts, using adult psychiatric inpatients as subjects. In the area of physical disabilities, Spaulding and Robinson (1984) used electromyography to study the effects of resisted and unresisted bilateral sanding on the upper extremities of patients with spinal cord injuries.

These studies contribute to our understanding of the properties of crafts as therapeutic modalities. Few studies were found, however, that tested the effectiveness of crafts in the achievement of therapeutic goals. In 1962, Llorens and Rubin published a detailed description of a graded activity program, including crafts, for emotionally disturbed children, but did not report a test of the program’s effectiveness. More recently, in a study of autistic children, Reilly, Nelson, and Bundy (1983) found that fine motor activities, including making puzzles, stringing beads, and coloring, were more effective than gross motor activities in eliciting vocalizations. Hardison and Llorens (1988) studied the effects of structured group activities on 3 adolescent delinquent girls with suspected vestibular processing difficulties. The researchers described gains made by all 3 of these subjects in areas of sensorimotor performance, self-esteem, and social behavior.

In the 1960s and early 1970s, perceptual-motor programs, notably those developed by Kephart and Frostig, were commonly used by educators to remedy visual perception in children with learning disabilities (Frostig & Horne, 1964; Kephart, 1960). Although these authors stressed the importance of three-dimensional manipulation as an element of remediation, they placed emphasis in the intervention process on gross motor activities and two-dimensional fine motor tasks. During the same period, occupational therapists also employed a perceptual-motor approach to some children with behavior and learning problems, but used very few three-dimensional manipulation activities and virtually no crafts (Llorens et al., 1964; Llorens, Rubin, Braun, Beck, & Beall, 1969; Minner, 1971).

A recent study by Oliver (1990) described a multisensory program to improve writing readiness skills in three groups of children who exhibited delay in this area. Such crafts as bead stringing, block design, parquetry, and paper folding complemented the therapy program, which consisted of the tracing of large movement patterns and approximations of manuscript letters in various media. The children participating in one-on-one 30-min therapy sessions once a week also received practice in letter formation supervised by a classroom aide, teacher, or parent. Although gains in two of the groups after 1 year were commensurate with normal maturation, gains, as measured by the Developmental Test of Visual-Motor Integration (Beery, 1982), were striking in a group of children who had demonstrated a disparity of greater than 15 points between the verbal and performance scores on the Wechsler Intelligence Scale for Children–Revised (Wechsler, 1974). This group showed a gain of 17 months, with a range of 14 to 22 months. Across two of the groups, boys showed greater gains than did girls (17 months as compared with 12 months, respectively).

The literature cited above suggests that a graded sequence of craft activities requiring increasingly more complex levels of three-dimensional eye-hand coordination could facilitate the acquisition of visuomotor skill. An investigation of this assumption with the use of child psychiatric patients as subjects may contribute to knowledge of both the efficacy of crafts and of visuomotor function in children with mental disorders.

**Method**

The primary hypothesis for this study was that child psychiatry patients who participate in a specific graded se-
quency of craft activities will be more likely to show improved posttest scores on the Developmental Test of Visual-Motor Integration than will patients who have not participated in the treatment. A related area of inquiry was the relation between study outcomes and other independent variables: sex, age, IQ, psychiatric diagnosis, psychotropic medication, and number of treatment sessions. The acceptable level for significance was preestablished at the .05 level of confidence.

A nonequivalent control group design was employed to compare two nonconcurrent groups, the treatment group and an earlier group of patients who had not received the treatment. Assignment to groups was random to the extent that all patients who were admitted to the hospital during the two consecutive periods of the study and who met predetermined criteria were included in the study.

Subjects
The subjects were children who, on admission to inpatient child psychiatry, scored below their chronological ages on the Developmental Test of Visual-Motor Integration. The treatment group consisted of all patients admitted during an 8-month period who scored below chronological age on the Developmental Test of Visual-Motor Integration and who were able to participate in the treatment (n = 33). To participate, the children were expected to have acquired basic discrimination skills for size, shape, color, and position and were checked routinely by means of simple identification tasks. The control group consisted of all patients admitted within an 18-month period 3 years earlier who scored below their chronological ages on the Developmental Test of Visual-Motor Integration (n = 24). Patients admitted to the same child psychiatry unit prior to the study participated in similar group and individual treatment programs, including education, recreation, group therapy, and occupational therapy. The only notable difference in routine for these earlier patients was that, instead of a graded sequence of craft activities, their occupational therapy program included unstructured craft sessions in which activities were self-selected. The occupational therapist, the physical environment, and the amount of attention given the patients remained consistent throughout the study period. The characteristics of the two groups of subjects are shown in Table 1.

Instrument
The Developmental Test of Visual-Motor Integration, a test of geometrical form reproduction, was first published in 1967 as a measure of the integration of visuomotor functions. The original standardization samples consisted of 1,039 children from preschool age through eighth grade. The test was constructed as an age scale. An early validity study (N = 594) showed a correlation of .89 between chronological age and number of forms correctly reproduced (Beery, 1982). The test has long been accepted and used as a valid and reliable measure of visuomotor integration. For the present study, improved test scores were defined as results demonstrating a 6-month difference between pretest (admission) and posttest (discharge) scores. A 6-month increase over pretest scores was considered a reasonable goal in that it allows for differences in test-taking ability and other individual differences. Among all subjects, the interval between pretests and posttests ranged from 18 to 128 days (M = 48 days).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Characteristics of the Comparison Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>Treatment Group (n = 33)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
</tr>
<tr>
<td>Age (in months)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>110</td>
</tr>
<tr>
<td>Median</td>
<td>111</td>
</tr>
<tr>
<td>Range</td>
<td>57–159</td>
</tr>
<tr>
<td>IQ</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>88</td>
</tr>
<tr>
<td>Median</td>
<td>90</td>
</tr>
<tr>
<td>Range</td>
<td>50–123</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td>Affective disorders</td>
<td>3</td>
</tr>
<tr>
<td>Conduct disorders</td>
<td>8</td>
</tr>
<tr>
<td>Attention deficit disorders</td>
<td>8</td>
</tr>
<tr>
<td>Other disorders</td>
<td>14</td>
</tr>
<tr>
<td>Psychotropic medication</td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td>13</td>
</tr>
<tr>
<td>No medication</td>
<td>20</td>
</tr>
<tr>
<td>Length of stay</td>
<td></td>
</tr>
<tr>
<td>M (in days)</td>
<td>44</td>
</tr>
<tr>
<td>Median</td>
<td>40</td>
</tr>
<tr>
<td>Range</td>
<td>18–75</td>
</tr>
</tbody>
</table>

Note. na = not applicable.

Procedure
The treatment, a specific graded sequence of craft activities, was instituted in the study year as a routine component of occupational therapy for all patients referred, with the exception of those patients who had not developed the basic discrimination skills of size, shape, color, and position. The sequence consisted of 17 activities along with 3 free choices from a group of 9 additional activities (see Figure 1). Free choices were included at intervals in order to give the children some decision-making experience within the structured program.

All the crafts were analyzed with respect to the following skill components:

- Sensorimotor skills—Tactile, kinesthetic, motor planning (laterality, directionality), motor accuracy (eye–hand coordination), verbal cues, visual cues.
The sequence of activities was then designed to provide a wide range of three-dimensional manipulations and to increase gradually in complexity. Each child proceeded until the sequence was completed or until he or she was discharged, whichever came first.

Records for both groups were examined and the following data were collected: admission and discharge scores on the Developmental Test of Visual-Motor Integration, psychiatric diagnosis, psychotropic medications, age, sex, IQ, and length of stay and, for the treatment group, number of occupational therapy treatment sessions. Using the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed.) (American Psychiatric Association, 1980) as a guide, we combined the 22 different diagnoses listed in the records into four categories of similar size that satisfactorily grouped the disorders according to type. The four categories were designated (a) affective disorders, (b) conduct disorders, (c) attention deficit disorders, and (d) other disorders (see Table 2 for a subclassification of the category of other disorders). Similarly, the 10 psychotropic medications mentioned were combined into a single Medication category, to be compared with the No Medication category.

**Data Analysis**

Three methods of statistical inference were used to analyze the data. The chi-square statistic was used to test the primary hypothesis by comparing frequency of improvement in scores on the Developmental Test of Visual-Motor Integration between the treatment and control groups. To better understand the degree of correspondence between the two groups, we used a *t* test to compare them with respect to mean age and mean IQ. Finally, a stepwise multiple regression was performed to assess the ability of independent variables, other than the treatment, to affect the test scores. To relate sex, IQ, age, medications (i.e., whether these had been prescribed), number of treatment sessions, and diagnosis to improvement, we defined the dependent variable as the difference between pretest and posttest scores on the Developmental Test of Visual-Motor Integration.

**Results**

An analysis of the data revealed that significantly more subjects in the treatment group improved their test scores by 6 months or more (*p* < .05) than did those in the control group. Of the treatment group (*n* = 33), 25 showed improvement on their test scores; of the control group (*n* = 24), 12 showed improvement. Thus, the primary hypothesis, that child psychiatry patients who participate in a specific graded sequence of craft activities will be more likely to show improved posttest scores on the Developmental Test of Visual-Motor Integration than will patients who have not participated in the treatment, was supported.

**Table 2**

<table>
<thead>
<tr>
<th>Recorded Diagnosis</th>
<th>Treatment Group (<em>n</em> = 14)</th>
<th>Control Group (<em>n</em> = 5)</th>
<th>Total (<em>n</em> = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oppositional disorder</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Pervasive developmental disorder</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Adjustment disorder</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Parent-child interaction, including sexual abuse</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Developmental delay</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 1.** Craft sequence.

- Visual perception—Perceptual constancy, figure-ground discrimination, parts-to-whole relationships, spatial relationships.
- Cognitive skills—Sequencing skills, number concepts, measuring skills.

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A t test comparison of mean age and mean IQ between the treatment and control groups showed no significant differences between the two with respect to either age or IQ. The mean age of the treatment group \((n = 33)\) was 111 months \((SD = 26.04)\); of the control group \((n = 24)\), 117 months \((SD = 19.74)\) \((t = 1.02, df = 54.0, p < .3101)\). The mean IQ of the treatment group was 89 \((SD = 16.54)\); of the control group, 84 \((SD = 17.04)\) \((t = -1.14, df = 48.8, p < .2612)\).

A regression analysis for the effect of other variables on outcomes showed that three variables accounted for 28% of the total variance \((\text{multiple } R = .5298; \text{multiple } R^2 = .2807; F \text{ ratio, } 6.63; p < .05)\). The three salient variables were age \((R = .354, F = 8.71)\), IQ \((R = .252, F = 4.35)\), and diagnosis of affective disorder \((R = .206, F = 2.85, p < .05)\). It must be noted, however, that unknown variables accounted for more than 70% of the total variance; the impact of any one of them was not consistent enough to be reflected in the outcome regressions.

Discussion

The primary purpose of this study was to discover whether a specific graded sequence of craft activities can improve visuomotor integration in children with mental disorders. The results support a tentative conclusion that graded craft activities are a factor in improvement of scores on a test of visuomotor integration. The place of graded crafts within a developmental continuum of activities that enhance visuomotor integration and skill learning needs further investigation, especially given the dearth of literature on three-dimensional manipulation as a remedial measure. The finding that the number of treatment sessions was not a factor in improvement suggests that more precise application of the development continuum concept to the analysis of craft activities and their order of presentation might pinpoint an optimally effective series, both in content and in length.

Although a relation between visuomotor ability and psychiatric illness has been suggested by the literature, such has not been confirmed, let alone precisely defined. Of the 58 children admitted to the facility during the period of data collection for the treatment group in this study, only 5 were excluded because they scored at or above chronological age on the Developmental Test of Visual-Motor Integration. Perhaps psychiatric illness and poor visuomotor skills are associated abnormalities, or perhaps illness impairs a child's test-taking ability. The fact that children with affective disorders tended to show more improvement on the Developmental Test of Visual-Motor Integration suggests that a child's ability to do his or her best on the initial evaluation may be affected by symptoms of this disorder, for example, depressed mood or psychomotor retardation. The association between psychiatric illness in children and subnormal visuomotor integration merits further scrutiny.

Several questions need to be addressed. If the treatment was effective, did it affect the child's test-taking ability, visuomotor integration, or both? Did the improved test scores result merely from remission of illness? These questions must be considered in light of the finding that medication, which is aimed at the symptoms of illness, apparently is not related to improvement in scores on the Developmental Test of Visual-Motor Integration.

Because it was not possible to compare concurrent groups, the study design lacked rigorous control over extraneous variables such as possible differences in ward personnel over time. Further, although mean ages and mean IQs were not significantly different in the two groups, improvement was related to age and IQ. This fact underscores the importance of matching these variables in future comparison groups. In light of these limitations, the findings of this study are tentative and await testing in future investigations.

Summary

The purpose of the research was to test the effectiveness of a graded series of craft activities on the improvement of visuomotor skills in an inpatient child psychiatry population. The Developmental Test of Visual-Motor Integration was used as a pretest and posttest to compare two nonconcurrent groups in the same setting, the treatment group \((n = 33)\) and an earlier group that had not participated in the graded series \((n = 24)\). It was posited that manipulation of objects, in the form of craft activities, plays a role in the developmental process of visuomotor skill acquisition. A significantly greater frequency of improvement was found in the treatment group \((p < .05)\). Improvement was related to age, IQ, and diagnosis with affective disorder. Mean age and mean IQ did not differ significantly between the two groups. Improvement was not significantly related to sex, psychotropic medications, number of treatment sessions, or other diagnoses.

A comparison of concurrent matched treatment and control groups could produce more conclusive findings regarding the effect of craft activities. The present study suggests that a more precisely developmental selection of crafts and a shorter sequence might be used in future tests. Further studies of the relation between visuomotor integration and psychiatric disorder in children and of the effect of psychotropic medication on visuomotor integration are also suggested.

Acknowledgments

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References


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