LEVEL OF CHALLENGE AND TASK PERSISTENCE:
A STUDY OF CHILDREN IN A
COGNITIVE ACTIVITY

by

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(ABSTRACT)

This study was conducted to examine Csikszentmihalyi's (1975a) Model of Flow among a sample of 4-year-old children engaged in a cognitive activity. Twenty-eight children undertook a pattern-making task with beads of different colors and shapes under three conditions. In the assigned-easy condition the children were given only the easiest patterns; in the assigned-difficult condition they were given the most difficult patterns; and in the choice condition they were free to choose the level of difficulty of the pattern.

It was hypothesized, on the basis of the Flow Model, that the intrinsic motivation to continue an activity, as measured by the number of attempts and time spent on the activity, would be highest when children were free to choose the degree of difficulty.

The results of the study supported the hypothesis. The children spent significantly more time on the activity in the choice condition, as compared to both the assigned-easy and the assigned-difficult conditions. The number of attempts were greater in the choice condition, as compared to the assigned-difficult condition. However, the number of attempts in the choice condition were not significantly greater than in the assigned-easy condition.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER I: STATEMENT OF THE PROBLEM</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of the Research</td>
<td>2</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER II: REVIEW OF THE LITERATURE</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>Theoretical Orientation</td>
<td>3</td>
</tr>
<tr>
<td>Empirical Research on Flow in Young Children</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER III: METHODOLOGY</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Description</td>
<td>12</td>
</tr>
<tr>
<td>Sample Selection Process</td>
<td>12</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>12</td>
</tr>
<tr>
<td>Pilot Study</td>
<td>15</td>
</tr>
<tr>
<td>Procedure</td>
<td>15</td>
</tr>
<tr>
<td>Recording of Data</td>
<td>17</td>
</tr>
<tr>
<td>Analysis of Data</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER IV: RESULTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion of Results</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER V: SUMMARY AND CONCLUSIONS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>REFERENCES</td>
<td>27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPENDIX A: Parental Consent Form</th>
<th>Page</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>APPENDIX B: Patterns</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPENDIX C: Groups and Conditions</td>
<td>33</td>
</tr>
<tr>
<td>VITA</td>
<td>34</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Figure 1</td>
<td>Model of Flow</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Extension of the Flow Model</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Mean and Standard Deviation of Age (in months) by Gender</td>
<td>19</td>
</tr>
<tr>
<td>Table 2</td>
<td>Means and Standard Deviations of Variables under the Three Conditions</td>
<td>20</td>
</tr>
<tr>
<td>Table 3</td>
<td>ANOVA with Repeated Measure on Condition</td>
<td>21</td>
</tr>
<tr>
<td>Table 4</td>
<td>t-test on the Pair-Wise Differences</td>
<td>23</td>
</tr>
</tbody>
</table>
CHAPTER I: STATEMENT OF THE PROBLEM

introduction

The purpose of this study was to examine Csikszentmihalyi's (1975a) concept of flow among a sample of 4-year-old children engaged in a cognitive activity. Flow refers to a state experienced when intrinsically motivated persons are actively engrossed in activities over which they have control and for which there is immediate feedback.

This study was based on the model presented by Csikszentmihalyi (1975a), which states that flow is most likely to occur among individuals when skills and challenges are equally matched. When the level of challenge is greater than the level of skill, the individual may experience worry or, if the mismatch is more extreme, anxiety. If an individual perceives the challenge to be lower than the level of skill required, the resulting state may be boredom which may turn into apathy if the ratio becomes too large (Csikszentmihalyi & Csikszentmihalyi, 1988).

Statement of the Problem

Play is of immense value for the development of children. Bruner (1972) and Rubin, Fein, and Vandenberg (1983) valued play for its beneficial impact on adaptation. Several researchers have suggested that play results in better adjustment to environment (Erikson, 1963), improved problem solving skills (Dansky & Silverman, 1973; Vandenberg, 1980), and greater creativity (Lieberman, 1965; Singer & Rummo, 1973; Wallach & Kogan, 1965). Play is also valued for its inherent qualities (Rogers & Sawyers, 1988). Thus, an understanding of conditions that encourage play would be beneficial. On the basis of the Flow Model, it was assumed that a child would be encouraged to continue a play activity if the child was in a state of flow. The purpose of this study was to gain a better understanding of the conditions under which children experience flow in cognitive play activities. Promoting these conditions during
cognitive play activity among children could ultimately facilitate cognitive development.

Purpose of the Research

The purpose of the research was to examine the occurrence of flow in a cognitive play activity for 4-year-old children. Intrinsic motivation to continue playing was measured for the children in both choice and assigned conditions.

Hypotheses

The first hypothesis of this study was that for children, intrinsic motivation to play, as measured by persistence in a play activity, would be greater when given the choice in selecting the degree of difficulty. The second hypothesis was that when given no choice over the degree of difficulty, greater persistence would be observed at lower degrees of difficulty, i.e. conditions which maximize success.
CHAPTER II: REVIEW OF THE LITERATURE

Introduction

Several researchers (Parten, 1932; Piaget, 1962; Caplan & Caplan, 1973; Sheridan, 1975; & Vygotsky, 1967) have focused on play and its beneficial impact on development. The following literature review is focused on the concepts of “flow”, play, intrinsic motivation, and task-persistence. A summary of relevant empirical research on flow in young children, and a discussion of the significance of this study in the context of existing literature follows.

Theoretical Orientation

Flow

Csikszentmihalyi and Bennet (1971) defined play as a state of experience which occurs when an actor’s ability to act matches the requirements for action. Developing this concept of play further, Csikszentmihalyi (1975a) formulated the flow model. According to this model, flow is experienced by an individual when the level of challenge in a given activity matches with the level of his skill. When the level of challenge is greater than the level of skill, the individual experiences worry and anxiety. When the level of challenge is less than the level of skill, the individual experiences boredom and apathy.

Flow can be depicted in the form of a chart as given in Figure 1. If the levels of challenge (difficulty) are represented by the Y-axis, and levels of skills by the X-axis, the diagonal space which represents the area where the corresponding challenges and skills meet shows flow. As skills of an individual increase with development (practice, experience) the person can take on higher challenges.

In an extension of Csikszentmihalyi’s model, Massimini and Carli (1986), stated that not only does one need the skills and challenges to be balanced for the flow experience, but that both skills and challenges should be above a certain level. When
Figure 1. Model of Flow (Adapted from Csikszentmihalyi, 1975a)
the skills and challenges are below this level a person might feel apathy. This extension is illustrated in Figure 2. The implication of this extension is that for the state of flow to occur, the skills and challenges should be above the person’s average level of skills and challenges, respectively.

The characteristics of persons experiencing flow, according to Csikszentmihalyi and Csikszentmihalyi (1988) are: intense involvement, deep concentration, clarity of goals and feedback, loss of sense of time, lack of self consciousness and transcendence of a sense of self, leading to (autotelic) intrinsically rewarding experience.

Flow experiences are intrinsically motivated. Intrinsic motivation to continue an activity becomes low when the individual gets bored or worried. When the skills and challenges match, the intrinsic motivation is high and the individual experiences flow (Csikszentmihalyi, 1975a).

Nicholls (1983) discussed the role of task involvement as motivation for achievement. He defined task involvement as a state in which learning is more inherently valuable, meaningful, or satisfying, and attention is focused on the task and the strategies needed to master it rather than on the self. He suggested some similarities between the state of flow and task involvement. An optimal level of difficulty is needed for both task involvement and flow. For both, the motivation is intrinsic and the task is an end in itself. According to Nicholls, some activities which were identified as flow by Csikszentmihalyi are also examples of task involvement. Thus it appears that there is a great degree of task involvement, when an individual is in a state of flow.

Play

According to Csikszentmihalyi (1979), play is a type of flow in which the player has control over the challenges. Play is of immense value for the development of
Figure 2. Extension of the Flow Model (Adapted from Massimini and Carli, 1986)
children. Play not only provides relaxation and joy to them, but is also a medium for
development. Play has been referred to as a medium for building cognitive concepts
(Vygotsky, 1976), a basis for language development (Caplan & Caplan, 1973) and an
apprenticeship to everyday living (Sheridan, 1975). Through play young children
develop an understanding and mastery of their environments. Play is voluntary and
it is intrinsically motivated.

Play is a difficult behavior to define. Numerous definitions have been proposed.
According to Rubin, Fein, and Vandenberg (1983), various researchers who have at-
ttempted to define play have taken three general approaches. In the first approach
play is defined as a disposition. In this approach to defining play there are six dis-
tinguishing characteristics of play: (a) play is intrinsically motivated; (b) attention
during play is on the means rather than the ends; (c) play is organism-dominated
and is distinguishable from exploration; (d) play involves pretense or non-literal be-
havior; (e) play is characterized by freedom from rules; and (f) play requires active
involvement. In the second approach, play is defined as an observable behavior. In
the third one, play is defined according to the context likely to evoke the disposition,
or likely to yield one or more of the behaviors identified as play. Rubin, Fein, and
Vandenberg (1983) defined play as “a behavioral disposition that occurs in
describable and reproducible contexts, and is manifest in a variety of observable
behaviors.”

Intrinsic Motivation

One of the shared characteristics of flow and play is that both types of activities
are intrinsically motivated. Intrinsic motivation involves inherent pleasure in per-
forming some activity (Lepper, Greene & Nisbett, 1973). Csikszentmihalyi (1975b)
examined the importance of intrinsic motivation in play. He identified characteristics
that a play activity must have to provide intrinsically rewarding experiences. Barnett
(1976) suggested that there is a contradiction in Csikszentmihalyi’s (1975b) flow model in distinguishing between play as an activity and play as a function of the state of the mind. She suggested that play is best described by the intention of the “player”. She further suggested that structured settings be modified to allow the individual to interact in a manner that is intrinsically rewarding. In response to criticism by Barnett (1976), Csikszentmihalyi (1976) stated that play is best described by the intention of the player, and further suggested that there is enough commonality in human behavior to predict what will be intrinsically rewarding for large categories of people.

Csikszentmihalyi (1978) discussed the role of attention in regulating states of consciousness by admitting or denying admission to various contents into consciousness. He suggested that for an activity to be inherently pleasurable or intrinsically motivating, an individual must narrow the focus of attention exclusively on the stimuli involved.

Gottfried (1985) described the three approaches researchers have taken to explain the intrinsic motivation to play: cognitive discrepancy theories, competence (mastery) theories, and attribution theories. Cognitive discrepancy theories suggest that intrinsic motivation results when a child encounters stimuli that do not match his or her existing cognitive structures. Children are motivated to reduce such discrepancy through exploration and play. One important implication of the cognitive discrepancy theory is that elements of novelty, incongruity, complexity and surprise in play materials and play experiences tend to increase arousal and facilitate play. Gottfried further suggested that since the nature of intrinsic motivation is multidimensional, and since matching toys to individual children’s development is difficult, the best course would be to provide an environment for children which is characterized by variety of stimulation. According to competence theories, children are moti-
vated to master their environment. They seek to interact effectively with their environment, and these interactions provide a feeling of mastery over their environment (White, 1959). Harter (1978) suggested that mastery is facilitated by optimally challenging experiences. Challenge is a dimension that enhances mastery motivation of play during childhood. In this respect, Csikszentmihalyi’s concept of flow appears to resemble the competence theories of play. Attribution theory on intrinsic motivation to play emphasizes the children’s ideas about their behavior. Whether play is perceived to be intrinsically motivating by a child, depends in part on the attributions the child makes, as to why he or she is playing. Gottfried suggested an interactive approach, where the intrinsic motivation for play is an outcome of complex interactions and interrelationships between the features of the three theories.

**Task Persistence**

Several researchers have used the player’s persistence to continue an activity as a measure of the individual’s intrinsic motivation to continue the activity. Lepper, Greene, and Nisbett (1973), in their study of the effect of rewards on intrinsic motivation, measured intrinsic motivation to continue an activity by the time spent on the activity. Morgan, Harmon, and Maslin (1987) also measured intrinsic motivation by the amount of time infants spent on a task. Redding, Morgan, and Harmon (1988) found that greater persistence was observed in infants and toddlers at moderately challenging tasks as compared to difficult tasks.

**Empirical Research on Flow in Young Children**

Kidd (1985) examined the concept of flow in a physical play activity of a bean bag toss game in a sample of 81, 4-year-olds. She measured intrinsic motivation to continue playing, by the number of attempts made to toss the bean bag. The children participated in both a choice and an assigned (no choice) condition, with the order of conditions counterbalanced. In the choice condition, the children chose the level
of difficulty at which they played, whereas, in the assigned condition, the children were assigned one of two levels of challenge (easy or hard). Consistent with the flow model, she found (within and across group comparison) that when children had a choice over the degree of difficulty of the game, they made a greater number of attempts to play, when compared to the assigned-hard condition. A significantly greater number of attempts were made (in the across group comparison) by the children in the assigned-easy condition, as compared to the children in the assigned-hard condition. She concluded that the choice of level of difficulty had a significant positive effect on the intrinsic motivation to continue the activity.

Godwin (1987) also examined the concept of flow in a physical play activity similar to that of Kidd in a sample of 35 preschool children. In Phase I, the children had the choice of the degree of difficulty at which to play the game. In Phase II, the children were randomly assigned to one of three conditions: choice, assigned-easy, and assigned-difficult. In Phase III, all the children again played in the choice condition. She used five measures of the characteristics of flow: number of attempts, percentage of successes, ratio of evaluation-seeking behavior to number of attempts, ratio of off-task behaviors to number of attempts, and the ratio of time spent off-task to time spent on-task. This design permitted across groups comparison of choice vs assigned conditions in Phase II and within group comparison of choice vs assigned conditions in Phases I, II and III. She found that assigned-easy group had a higher success rate in Phase II, while the assigned-difficult group had a lower success rate. She did not find differences within or across groups on the other measures of flow.

This study was an extension of Kidd (1985), and Godwin (1987) using a cognitive activity, instead of a physical activity. This study was designed to evaluate the existence of the state of flow and its effect on intrinsic motivation for preschool children: a result, which has been found to be true for older children (Csikszentmihalyi, 1979).
for adults (Graef, Csikszentmihalyi and Gianinno, 1983), and for preschool children in a physical play activity (Kidd, 1985; Godwin, 1987). The results also add to the literature on cognitive play activity.
CHAPTER III: METHODOLOGY

Sample Description

The sample consisted of 28 children in the age range of 4-0 to 4-11. A pattern-making task, which was used for this study, was expected to provide a degree of challenge in line with the level of skills of a 4-year-old. Using younger children may result in a degree of challenge significantly higher than the level of skills and therefore, a state of flow may not occur. Similarly for older children, the degree of challenge of this task may be significantly lower than the skill level, and therefore, again state of flow may not occur.

Sample Selection Process

The sample of 28 children was drawn from the 4-year-olds attending the preschools in the Blacksburg area. Parental consent was obtained using the form shown in Appendix A. Only children who demonstrated initial intrinsic interest in the pattern-making task (described below) were selected. This was done a week before the actual data collection. The activity was presented on a table during a "free-play" period, e.g. centers activity, over a period of five days. The children who spent at least three minutes engaged in the activity were selected for this study. This approach is similar to the one used by Lepper, Greene, and Nisbett (1973) in a study of intrinsic motivation with preschool age children.

Instrumentation

A pattern-making task was used for data collection. The task consisted of beads of four different shapes: round, oval, cylindrical and square; six different colors: red, blue, green, yellow, orange and purple; and cards which had patterns printed on them. The patterns were recreated with the help of beads. The patterns were of varying degrees of difficulty. The patterns on these cards were of 3 types: (a) beads
were of the same shape but different colors, (b) beads were of the same color but
different shapes, and (c) beads were of different shapes and colors. The number of
beads on a pattern ranged from 4 to 8. The patterns used are illustrated in Appendix
B.

This activity was selected for its similarity to one used by Inhelder & Piaget
(1964). In their study on graphic collections children, in the age group of 2 1/2 - 5
years, used material made out of wood and plastic and in four different shapes -
squares, triangles, rings and half rings. When asked to put together the things that
were alike, their initial response was typically putting together things with identical
or similar shapes, in a straight line. Occasionally, they would put together different
shapes but of the same color. It is apparent from this study that children in this age
group are capable of differentiating various shapes and colors, but in the earliest
stages one characteristic at a time. This suggests that the level of skills required for
the proposed activity was suitable for 4-year-olds, i.e. the level of skill required was
such that this activity was neither too simple nor too difficult for normal 4-year-olds.
It was assumed in this study that 4-year-old children could distinguish colors more
easily than shapes. Inhelder and Piaget (1964), in their study of children found that,
when questions were asked about shapes and colors, children tended to make more
mistakes about shapes rather than colors. Gesell and Ilg (1949) also reported that
children acquire the ability to differentiate colors before the ability to differentiate
shapes.

The patterns were classified into five levels of difficulty.

Level 1: There were four pattern cards in this level. Each pattern card had four beads
of the same shape and different colors. Each child was presented with 12 beads of
the same shape but of different colors. Each child was then asked to reproduce the
pattern with the given beads. The maximum score on each pattern card was 4 points: 1 point each for the correct color.

**Level 2:** There were four pattern cards in this level. Each pattern card had four beads of the same color but of different shapes: round, square, cylindrical and oval. Each child was provided with 12 beads of the same color but of different shapes. Each child was then asked to reproduce the pattern with the given beads. The maximum score on each pattern card was 4 points: 1 point each for the correct shape.

**Level 3:** There were four pattern cards in this level. Each pattern card had six beads of the same shape but of different colors. Each child was provided with 18 beads of the same shape but of different colors. These patterns were considered more difficult since more beads were used as compared to levels 1 and 2. The maximum score on each pattern card was 6 points: 1 point each for the correct color.

**Level 4:** There were four pattern cards in this level. Each pattern card had four beads of different shapes and of different colors. Each child was provided with 16 beads of various colors and shapes. As both the colors and shapes varied on each pattern card, the level of difficulty was considered higher than that in the previous levels. The maximum score on each pattern card was 8 points, with 2 for each bead: 1 for the correct color, and 1 for the correct shape.

**Level 5:** There were four pattern cards in this level. Each pattern card had eight beads of different colors and of different shapes. Each child was provided with 24 beads of different colors and of different shapes. These patterns were considered to be more difficult than those of level 4 because of the greater number of beads. The maximum score on each pattern card was 16 points, 2 points for each bead: 1 each for the correct color, and 1 each for the correct shape.
Pilot Study

A pilot study was conducted with five children, to test the pattern-making task and familiarize the experimenter with the data collection process. It was observed during the pilot study that presence of other children in the room distracted the child for whom the data was being collected. Therefore, it was decided to conduct this study in a separate room without any other children being present.

Procedure

The children were randomly assigned to one of three groups: I, II, and III. The study was carried in three phases as shown in Appendix C.

In Phase I, the children in Group I were assigned to the choice condition where they were free to choose the level of difficulty of the pattern they wanted to reproduce; the children in Group II were in the assigned-easy condition, reproducing the patterns of level 1; and the children in Group III were in the assigned-difficult condition, reproducing the patterns of level 5. In Phase II, Groups I, II, and III were in the assigned-easy, assigned-difficult, and choice conditions, respectively. In Phase III, Groups I, II, and III were in the assigned-difficult, choice, and assigned-easy conditions, respectively. Therefore, every child was exposed to all the three conditions. There was at least a five day span between any two phases, for every child.

To start the activity, the children were read the following instructions: “This is a pattern-making game. If you like it, you may play this game. If you want to stop playing this game anytime, just let me know.” Further instructions were given based on the condition: choice condition, assigned-easy and assigned-difficult.

Assigned-Easy

In the assigned-easy condition only the four patterns of Level-1 were used in the same order as described in level 1. The first pattern was placed in front of the child on a table with the 12 beads to be used for the pattern. In addition to these in-
structions, the child was told the following: “Here is a pattern with four beads of different colors. I would like you to make this pattern with the beads.” At the completion of each pattern, the child was asked the following question: “Do you want to make another pattern?” If the child replied in the affirmative, the next pattern (of Level-1) was placed in front of the child with the beads to be used for that pattern. If the child wished to continue after completing all the four patterns, they were repeated in the same order.

Assigned-Difficult

In the assigned-difficult condition only the four patterns of Level-5 were used in the same order as described in level 5. The first pattern was placed in front of the child on a table with the 24 beads to be used with the pattern. In addition to the instructions, the child was told the following: “Here is a pattern with eight beads of different shapes and colors. I would like you to make this pattern with the beads.” At the completion of each pattern, the child was asked the following question: “Do you want to make another pattern?” If the child expressed his/her desire to make another pattern, the next pattern was placed in front of the child with the beads to be used for that pattern. If the child wanted to continue after completing all the four patterns, they were repeated in the same order.

Choice

In the choice condition the first pattern of each of the five levels was placed on the table in front of the child. The beads to be used for the pattern were placed next to the pattern. In addition to these instructions, the child was asked the following: “Here are five different patterns which we can make with the beads. Which pattern would you like to make?” Once the child picked a pattern, the patterns of the other four levels and the associated beads were removed. The child was then told: “Can you make this pattern with the beads.” On completion of each pattern, the child was
asked the following question: "Do you want to make another pattern." If the child wished to make another pattern, the next set of five patterns, one from each level, were placed in front of the child with the beads to be used with that pattern, and the above process was repeated. If the child wished to continue after completing a pattern from each of the four sets of five levels of patterns, they were repeated in the same order.

Recording of Data

In all the three conditions, the experimenter recorded the number of attempts, the number of points scored, the total time spent on the activity, the level of the pattern and the condition (choice, assigned-easy, or assigned-difficult).

The intrinsic motivation to continue the activity was measured by the number of patterns attempted as well as the time spent on the activity. Kidd (1985) and Godwin (1987) used similar measures for intrinsic motivation. Lepper, Greene, and Nisbett (1973), in their study of the effect of rewards on intrinsic motivation, measured intrinsic motivation to continue an activity by the time spent on the activity.

Analysis of Data

The score on each pattern was standardized by dividing it by the maximum score on the pattern. The mean score over all the patterns attempted was calculated for each child under each condition. Means and standard deviations of the three variables (number of attempts made, the amount of time spent, and the score), was calculated under the three conditions (choice, assigned-easy, and assigned-difficult). A one-way ANOVA with repeated measures on condition was performed on each of the three variables to test whether the conditions had an effect on the variables. An ANOVA with repeated measures was performed, since there were repeated measurements on each child. A t-test was also conducted on the pair-wise differences whenever the overall null hypothesis of no mean difference was rejected.
CHAPTER IV: RESULTS

The sample of this study consisted of 13 boys (46\%) and 15 girls (54\%). Their mean age was 53.15 months (SD = 3.45). The mean age of the sample, its standard deviation, and the distribution of the sample between boys and girls is presented in Table 1.

On average, 8.00 attempts (SD = 2.72) were made in the choice condition, while the number of attempts made in the assigned-easy and assigned difficult-conditions were 7.50 (SD = 0.98) and 3.82 (SD = 2.10), respectively. The standard deviation of number of attempts was lower in the assigned-easy condition as compared to the other two conditions. The average time spent on the activity was 13.14 minutes (SD = 4.83) in the choice condition, while the average time spent was 9.61 minutes (SD = 3.76) and 9.46 minutes (SD = 3.89) in the assigned-easy and assigned difficult-conditions, respectively. In the assigned-easy condition all subjects obtained a perfect score. The average scores in the choice and assigned-difficult conditions were 0.97 (SD = 0.02) and 0.87 (SD = 1.28), respectively. The standard deviation of the score was higher in the assigned-difficult condition as compared to the other two conditions. Means and standard deviations of the number of attempts made, the amount of time spent (in minutes) on the activity, and the average score per attempt are reported in Table 2.

The analysis of variance indicated a significant effect of condition on the number of attempts, $F(2, 54) = 55.84$, $p < .01$. The analysis of variance also indicated a significant effect of condition on the time spent on the activity, $F(2, 54) = 12.67$, $p < .01$. The results of the repeated measure ANOVA are presented in Table 3. Repeated measure ANOVA was not carried out on score, since the variance of score was zero in the assigned-easy condition.
Table 1

Mean and Standard Deviation of Age (in months) by Gender

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<th>Gender</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>13</td>
<td>54.31</td>
<td>2.84</td>
</tr>
<tr>
<td>Females</td>
<td>15</td>
<td>52.13</td>
<td>3.58</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>53.15</td>
<td>3.45</td>
</tr>
</tbody>
</table>
Table 2

Means and Standard Deviations of Variables under the Three Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>No. of attempts</th>
<th>Time spent (in minutes)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Choice</td>
<td>8.00</td>
<td>2.72</td>
<td>13.14</td>
</tr>
<tr>
<td>Assigned-Easy</td>
<td>7.50</td>
<td>0.98</td>
<td>9.61</td>
</tr>
<tr>
<td>Assigned-Difficult</td>
<td>3.82</td>
<td>2.10</td>
<td>9.46</td>
</tr>
</tbody>
</table>
Table 3

ANOVA with Repeated Measure on Condition

**PANEL A.** Number of attempts

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degree of Freedom</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>291.60</td>
<td>2</td>
<td>145.80</td>
<td>55.81*</td>
</tr>
<tr>
<td>Within Cells</td>
<td>141.07</td>
<td>54</td>
<td>2.61</td>
<td></td>
</tr>
</tbody>
</table>

**PANEL B.** Time Spent

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degree of Freedom</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>243.17</td>
<td>2</td>
<td>121.58</td>
<td>12.67*</td>
</tr>
<tr>
<td>Within Cells</td>
<td>518.17</td>
<td>54</td>
<td>9.60</td>
<td></td>
</tr>
</tbody>
</table>

* p < .01.
The results of the t-tests show that the number of attempts in the choice condition were significantly greater than the number of attempts in the assigned-difficult condition, \( t(27) = 9.57, p < .01 \). However, even though there were greater number of attempts made in the choice condition as compared to the assigned-easy condition, the difference was not significant, \( t(27) = 1.02, p > .05 \). This insignificant difference in the number of attempts between the choice and assigned-easy conditions, even though the time spent was greater in the choice condition, is because the time per attempt was more in the choice condition, since it involved a greater average number of beads per attempt. The number of attempts in the assigned-easy condition were significantly greater than the number of attempts in the assigned-difficult condition, \( t(27) = 10.11, p < .01 \).

The average time spent on the activity in the choice condition was significantly more than the time spent in the assigned-easy condition, \( t(27) = 4.95, p < .01 \). The average time spent on the activity in the choice condition was also significantly more than the time spent in the assigned-difficult condition, \( t(27) = 3.99, p < .01 \). There was no significant difference in the time spent between the assigned-easy and assigned-difficult conditions, even though the number of attempts were greater in the assigned-easy condition. This is because the time per attempt was more in the assigned-difficult condition, since it involved a greater number of beads per attempt.

The average score in the choice condition was significantly lower than the average score in the assigned-easy condition, \( t(27) = -7.29, p < .01 \). Moreover, the average score in the choice condition was significantly higher than the average score in the assigned-difficult condition, \( t(27) = 4.56, p < .01 \). The average score in the assigned-easy condition was significantly higher than the average score in the assigned-difficult condition, \( t(27) = 5.42, p < .01 \). The results of the t-test on the pair-wise differences are presented in Table 4.
### Table 4

#### t-test on the Pair-Wise Differences

<table>
<thead>
<tr>
<th>Variable</th>
<th>Conditions</th>
<th>M</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of attempts</td>
<td>(Choice-A.Easy)</td>
<td>0.50</td>
<td>2.57</td>
<td>1.02</td>
</tr>
<tr>
<td>No. of attempts</td>
<td>(Choice-A.Diff)</td>
<td>4.18</td>
<td>2.31</td>
<td>9.57*</td>
</tr>
<tr>
<td>No. of attempts</td>
<td>(A.Easy-A.Diff)</td>
<td>3.68</td>
<td>1.93</td>
<td>10.11*</td>
</tr>
<tr>
<td>Time Spent (in minutes)</td>
<td>(Choice-A.Easy)</td>
<td>3.54</td>
<td>3.78</td>
<td>4.95*</td>
</tr>
<tr>
<td>Time Spent (in minutes)</td>
<td>(Choice-A.Diff)</td>
<td>3.68</td>
<td>4.88</td>
<td>3.99*</td>
</tr>
<tr>
<td>Time Spent (in minutes)</td>
<td>(A.Easy-A.Diff)</td>
<td>0.14</td>
<td>4.42</td>
<td>0.17</td>
</tr>
<tr>
<td>Score</td>
<td>(Choice-A.Easy)</td>
<td>-0.03</td>
<td>0.02</td>
<td>-7.29*</td>
</tr>
<tr>
<td>Score</td>
<td>(Choice-A.Diff)</td>
<td>0.10</td>
<td>0.12</td>
<td>4.56*</td>
</tr>
<tr>
<td>Score</td>
<td>(A.Easy-A.Diff)</td>
<td>0.13</td>
<td>0.13</td>
<td>5.42*</td>
</tr>
</tbody>
</table>

* p < .01.
The children appeared to be reluctant in participating in the task in phase III, especially if the condition in the previous phase happened to be assigned-difficult. They were relatively eager to participate if the condition in the previous phase was choice or assigned-easy. This qualitative observation suggested that the children did not enjoy the task in the assigned-difficult condition.

The examiner also noted other qualitative responses of the children during the activity. On completion of the task in phase III, the children were asked to pick the day when they enjoyed the task the most. The response “I liked it when I could pick and choose the pattern cards” was typical of the responses received.

It was also observed in the assigned-difficult condition that some of the children were verbalizing their actions while completing the task. For example, a child, looking at the pattern said: “This is a yellow square”; then looked at the beads and said: “Now I need a yellow square”.

Discussion of Results

The results from the ANOVA suggested that the condition (choice, assigned-easy or assigned-difficult) significantly affected both the number of attempts and the time spent on the activity. The result that children spent significantly greater time on the activity in the choice condition, as compared to both assigned-easy or assigned-difficult conditions, supports Csikszentmihalyi’s model of flow. Significantly greater number of attempts in the choice condition over the assigned-difficult condition also supports the model. Lower number of attempts in the assigned-difficult condition as compared to the choice or the assigned-easy conditions could be a result of anxiety caused by greater degree of difficulty. However, the result of insignificantly greater number of attempts in the choice condition over the assigned-easy condition does not support the model. Overall, three of the pairwise comparisons provided support
to the first hypothesis which stated that greater persistence would be observed when
the children had the choice over the degree of difficulty.

The results of this study are congruent with Redding, Morgan, and Harmon
(1988) which found that greater persistence was observed in infants and toddlers at
moderately challenging tasks as compared to difficult tasks.

The qualitative observations made during the data collection suggested that the
task was most enjoyable in the choice condition.

The fact that, children made greater number of attempts in the assigned-easy
condition, as compared to the assigned-difficult condition is consistent with the sec-
ond hypothesis which stated that when given no choice over the degree of difficulty,
greater persistence would be observed at lower degrees of difficulty, i.e. conditions
which maximize success.

The results on the average score under the three conditions suggested that the
degree of difficulty was the highest in the assigned-difficult condition followed by the
choice condition and then the assigned-easy condition.
CHAPTER V: SUMMARY AND CONCLUSIONS

The purpose of this study was to examine Csikszentmihalyi's (1975a) Model of Flow among a sample of 4-year-old children engaged in a cognitive activity. Twenty-eight children undertook a pattern-making task with beads of different colors and shapes under three conditions. In the assigned-easy condition the children were given only the easiest patterns; in the assigned-difficult condition they were given the most difficult patterns; and in the choice condition they were free to choose the level of difficulty of the pattern.

It was hypothesized, on the basis of the Flow Model, that the intrinsic motivation to continue an activity as measured by the number of attempts and time spent on the activity would be highest when children were free to choose the degree of difficulty.

The results of the study support the hypothesis. The children spent significantly more time on the activity in the choice condition, as compared to both the assigned-easy and the assigned-difficult conditions. The average number of attempts were also greater in the choice condition, as compared to the assigned-difficult condition. However, the number of attempts in the choice condition were not significantly greater than in the assigned-easy condition.

The implication of this study is that providing 4-year-old children with a choice over the degree of difficulty in tasks similar to the pattern-making task used in this study, would optimize the level of mastery motivation, and encourage cognitive development.

One of the limitations of this study was that the results were based on a small volunteer sample of 4 year old children. Therefore, generalizations of the results of this study to other groups may not be possible.
References


Kidd, K. D. (1985). Control of level of challenge and its effect on task persistence. Virginia Polytechnic Institute & State University, Blacksburg, VA.


Appendix A

Parental Consent Form

June 10, 1991

PARENTAL CONSENT FORM

Dear Parent:

Play is considered important for the development of children. We are conducting a research project which will throw light on the conditions that encourage play. The children will be participating in a simple and interesting task of making patterns with colored beads. Each child will be invited on two different days to play this game for about ten minutes for each session. The activity will be conducted at your child's school during a free-play time. No child will be forced to participate in the project against his/her will and no risks are involved.

All the information obtained about your child will be kept confidential. We will be happy to share our findings with you upon completion of the study.

If you have any questions or require more information, please do contact us. Thank you for your cooperation.

Sincerely,

Arati Kumar

Arati Kumar
(703-552-9293)

Dr. Janet Sawyers
(703-231-6148)

jb

I acknowledge that I have been informed about the nature of the study and I give consent for my child to participate in this study.

NAME OF THE CHILD_____________________________________________________

SIGNATURE OF THE PARENT___________________________________________
### Appendix C

**Groups and Conditions**

<table>
<thead>
<tr>
<th>Group</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Choice</td>
<td>Assigned-Easy</td>
<td>Assigned-Difficult</td>
</tr>
<tr>
<td>II</td>
<td>Assigned-Easy</td>
<td>Assigned-Difficult</td>
<td>Choice</td>
</tr>
<tr>
<td>III</td>
<td>Assigned-Difficult</td>
<td>Choice</td>
<td>Assigned-Easy</td>
</tr>
</tbody>
</table>
VITA

Arati Kumar was born in New Delhi, India on June 19, 1962, the daughter of Kanta and Ravi Nikore. She graduated from Lady Irwin Higher Secondary School in 1979. She received a Bachelor of Arts in Psychology with a specialization in Industrial Psychology in 1982. In 1984, she obtained her Master of Social Work with a major in Family and Child Welfare.

Arati began her graduate work at Virginia Polytechnic Institute and State University in Family and Child Development in September, 1985, and completed the requirements for the Master of Science in September, 1991. During a part of the period of graduate studies, she held a Teaching Assistantship as a Head Teacher for the infants in Virginia Tech Child Development Laboratory. In addition, she assisted one of her professors in organizing a seminar on communication. She is also a member of NAEYC and SACUS.

Arati is married to Raman Kumar, a professor in the Department of Finance at Virginia Polytechnic Institute and State University. They have been staying in Blacksburg since 1985, and have two daughters, Neha, 5 years old, and Arushi, 4 months old.

Arati Kumar