EFFECTS OF OBSERVER'S EXPERIENCE AND SKILL LEVEL ON LEARNING AND PERFORMANCE IN MOTOR SKILL MODELING

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To Bruce . . .

"the wind beneath my wings"

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ABSTRACT

Expertise effects on response acquisition (learning) and performance reproduction (performance) (Bandura, 1986) in dance observational learning were investigated. Over an acquisition period, forty university students with varied movement backgrounds observed dance demonstrations, arranged still photos to represent the dances, and performed each dance. Learning was assessed via a pictorial-resequencing task. Dance performance accuracy and quality were evaluated via detailed analyses of videotaped performances. Results indicated that dance experts learn more and perform better than novices ($p < .05$) in a modeling situation, and learning and performance scores are positively correlated at a moderate level. Entry-level dance skill is the best present indicator of success in dance observational learning. Elementary instruction can improve beginner dancers' observational learning ability. The findings support Bandura's social cognitive theory of modeling (1986), extend the knowledge base related to the effects of expertise in motor skill acquisition, and have implications for dance and other motor skill educators.

RESUME

Les effets de l'expertise sur l'acquisition de réponses (apprentissage) et la reproduction de la performance (performance) (Bandura, 1986) dans l'apprentissage de la danse par observation furent étudiés. Au cours d'une période d'acquisition, quarante étudiants universitaires ayant des acquis variés en mouvements observerent des démonstrations de danses, prirent des prises de vue fixes représentatives de ces danses et exécuterent chaque danse. L'apprentissage était evalue au moyen d'une epreuve de remise en ordre des images. Des performances sur rubans magnétoscopiques furent analysées de façon detailee afin d'évaluer l'exactitude et la qualité de la performance en danse. Les résultats obtenus indiquent que l'expertise en danse influence les deux phases du processus de modélisme; les experts surpassant les débutants dans les deux cas ($p < .05$). Il y a une corrélation positive modéree entre l'apprentissage et la performance bien que des differences inexpliquées entre les deux subsistent. Présentement, l'adresse initiale en danse demeure le meilleur indicateur de succes dans l'apprentissage de la danse par observation mais il semble que d'autres acquis en compétences motrices et non-motrices puissent contribuer au succès du modelisme chez certains individus. Les facultes d'apprentissage de la danse par observation des débutants peuvent être améliorees au moyen de directives élémentaires en danse. Ces résultats supportent la théorie cognitive sociale de modélisme (Bandura, 1986),

elargissent la base de nos connaissances reliee aux effets de l'expertise dans l'acquisition de competences motrices, et ont des implications pour les educateurs en danse et autres habiletés motrices.

TABLE OF CONTENTS

Page

Page

Page

Page

Page

Page

LIST OF TABLES

TABLE Page

LIST OF FIGURES

MANUSCRIPTS AND AUTHORSHIP

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PREFACE

Instruction in structured styles of dance often relies heavily on the assumption that students will be able to learn patterns of movement by observing demonstrations of the desired sequences. However, the success of this procedure is frequently less than desired, and teachers do not always understand why this is so. Concerns for these dance teachers led this researcher to questions about the modeling process in general and then to an interest in the effect of observer characteristics on the process. Bandura's social cognitive theory of modeling (1986) appeared to provide an appropriate framework for the analysis of these concerns, and its application to a practical dance-acquisition situation became the foundation for the work documented in this manuscript. The specific questions addressed relate to the influence of dance and other movement expertise on the ability to perceive and retain information from the demonstration and reproduce that information physically.

Organization of the Thesis

This dissertation is being presented in the alternative, multiple-paper, rather the traditional thesis format. Each chapter has been designed so that it might be read and understood independently of the others. Chapter 1 is probably not suitable for publication in its present form. Its function herein is to introduce and provide background for the topics considered in following chapters. Similarly, Chapter 5 is included as an overall summary of this manuscript.

Chapters 2, 3, and 4 appear as publishable papers. As such, they each contain an abstract and introduction; methodology, results, discussion, and conclusions sections; and their own reference lists. However, each is considerably longer than would be acceptable by most journals due to added material deemed necessary for this dissertation. Tables and figures appear within the text, and other formatting not necessarily appropriate to journal publications was occasionally used to enhance readability of this document.

Chapter 1 provides an introduction to the rest of the document, including a full review of the literature. It concludes with a presentation of some of the questions arising from the literature and the rationale for the current research that was based on those questions. A reference list is included.

Data for the three reports that appear in Chapters 2, 3, and 4 were collected at the same time, in the winter of 1990, and were considered from different perspectives to address varied questions. The same 40 university students, 10 dance majors and 30 physical education majors, were used throughout the research. They were treated as a single group with varied dance experience in Chapter 2, as expert and novice dancers in Chapter 3, and as a single group of 29 novices in Chapter 4.

Valid, independent measures of the two phases of observational learning were essential to this investigation. Hence, Chapter 2 details the development of these testing instruments and the procedures for their use. In addition, the relationship between learning and performance, as measured in this study, was investigated to consider the interrelatedness of the components of the modeling process.

Chapter 3 then focuses specifically on expert-novice differences in learning and performing dance from the observation of demonstrations. Qualitative data supplements the quantitative findings to evaluate the total observational learning process. This chapter also presents the procedure used to assess expertise within a group of novice dancers.

Chapter 4 is an exploratory look at the contribution of various movement experience factors on dance observational learning by beginner dancers. Modeling success is considered both before and after the students participated in an elementary course in dance.

Finally, Chapter 5 summarizes the rationale for the project and the conclusions drawn from the results of the study. Theoretical and practical implications of the research are offered. Appendices present additional documents found in theses presented in the traditional format.

Statement of Original Contribution to Knowledge

The research presented in this thesis makes an original contribution to the understanding of the role of dance expertise on the observational learning of dance. To the best of the researcher's knowledge, the application of Bandura's (1986) theory to investigate the influence of expertise on each of the two phases of the modeling process in a dance acquisition setting had not been made previously. In addition, it is believed that this project contained the initial attempt to adapt the pictorial-resequencing task (Carroll & Bandura, 1982) for use with a relatively lengthy, ecologically valid movement sequence.

Conclusions of the research that appear to be original and may promote additional study include the belief that the resequencing task may not assess all of the learning (response acquisition) that occurs as students observe dance demonstrations. Although others have acknowledged that overt performance reflects skills in addition to those that permit an understanding of what was demonstrated, the discrepancies between learning and performance scores found in this research warrant further investigation. Such research should enhance our understanding of the observational learning process and the role of cognition in motor skill acquisition.

In addition, it is believed that this research provides the first documentation of the influence of dance expertise on the prediction of modeling ability by beginner dancers. Skill in basic dance movements seems to be our best present indicator of success in dance observational learning. Hence, it appears that audition sessions frequently used by dance teachers are highly valid as assessments of potential learning ability, and their use by knowledgeable educators should be continued.

CHAPTER 1

INTRODUCTION

INTRODUCTION

In motor skill instructional settings, demonstrations are frequently the preferred method of presenting task information to the learner (Bird & Ross, 1984). Teachers of physical education, coaches, and dance instructors recognize that novel and modified movement patterns are often most easily acquired when the learner has had an opportunity to see the desired action. This production of a behavior pattern by one individual, known as the model, followed by either an immediate or delayed attempt to replicate that behavior by another, the observer, constitutes the phenomenon known as observational learning, imitation, or modeling.

The prominence of demonstrations in motor skill acquisition settings seems to indicate the value of the technique. However, it is also recognized that learners who observe a demonstration are not always able to replicate the modeled behavior immediately. To enhance observational learning, astute educators assess group and individual differences and attempt to structure demonstrations to meet the varied needs of their students. However, other instructors seem unable to identify the reasons behind the difficulties students have in acquiring the performance skills demonstrated. These educators frequently persist in repeating demonstrations and physical practice with no variation in the procedure. Performance by the students may or may not improve.

Instructors who understand the observational learning process and the difficulties learners might encounter within that process should be able to evaluate the learning situation and alter the emphasis of their lessons appropriately. Unfortunately, much of what is "known" about modeling in motor skill acquisition has been based primarily on intuition and experience. Systematic research in modeling in motor skill acquisition has not been extensive, and observational learning is still not adequately understood (Adams, 1987). Many questions remain to be answered if instructors of motor skills are to structure effective demonstration experiences consistently.

This chapter presents a review of pertinent literature related to motor skill modeling. It concludes with a summary suggesting specific issues that warrant additional research and a rationale for the series of studies reported in this thesis.

Review of the Literature

According to Bandura's (1986) social cognitive theory, observational learning occurs through two interrelated phases: response acquisition and performance reproduction. Knowledge of these phases and their contribution to the observer's ultimate overt response should help motor skill instructors develop experiences to enhance observational learning. However, understanding the total process and the difficulties which students may experience in relation to each phase requires that response acquisition and performance reproduction be evaluated independently. Support for this assertion and procedures for assessing response acquisition are discussed in the following review.

If response acquisition and performance reproduction are measured independently, variables influencing observational learning can be examined for their effect on each phase of the process. Although there are many variables to be considered in designing appropriate observational learning experiences, the current research focuses on ways in which prior motor skill experiences of the observer affect the modeling process.

Topics examined in this review of the literature are discussed under the following headings: Bandura's social cognitive theory, evaluating learning in motor skill modeling, overview of research in selected aspects of motor skill modeling, and the effects of age, gender, and prior experience of the observer on the observational learning process.

Bandura's Social Cognitive Theory

The description of observational learning in Bandura's social cognitive theory (1986) appears to be the most frequently used theoretical base for modeling research in motor behavior. Bandura proposes that modeling facilitates the acquisition of novel skills and enables the observer to refine and reorganize existing skills.

The theory (Bandura, 1986) postulates that four fundamental subprocesses govern the observer's success in acquiring and reproducing stimulus information. Attention and retention regulate the perception and encoding of relevant details of the modeled behavior. Motor reproduction, the third subprocess, organizes the behavioral components into the appropriate response patterns. Finally, motivation determines whether or not the response will be overtly reproduced. Bandura states that attention and retention contribute to the response acquisition phase of observational learning. Motor reproduction and motivation contribute to performance reproduction. Figure 1.1 illustrates the phases of Bandura's theory.

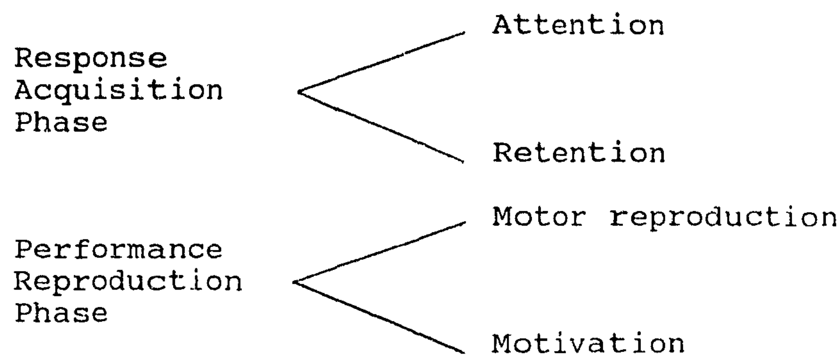

Figure 1.1. Bandura's social cognitive theory of observational learning (1986).

The product of response acquisition is a symbolic cognitive representation of the observed behavior. According to Bandura, its accuracy is essential for reliable performance. At the same time, the physical performance produced during the second phase of the process helps the observer redefine elements of the cognitive representation that may be inaccurate or unclear. Attention, retention, motor reproduction, and motivation are each believed to contribute to the overall process.

Attention

The attentional subprocess of the modeling paradigm is elemental in that the observer must attend to, recognize, and discriminate between the distinctive features of the modeled act. Several factors may influence the attentional subprocess. Characteristics of the model, such as relationship to the observer and clarity of the model's actions, are highly influential on what details of the demonstration receive the observer's attention. The nature of the modeled behavior, its salience and complexity, also affects the observer's attention and influences the rate and level of observational learning.

In addition, the observer's perceptual set and capacity to process information will partially determine which features of the observed stimulus are attended to and how those features are interpreted. These cognitive capabilities are based on past experiences and situational requirements and are critical to the attentional subprocess. They give coherence and meaning to the modeled information (Bandura, 1986). Furthermore, observers who possess both effective cognitive skills and prior knowledge related to the modeled behavior are generally able to perceive the fine details of that behavior. Experience enables people to recognize performance differences that less experienced observers may not distinguish. Therefore, adjusting observational learning experiences to coincide with the observer's cognitive capabilities is likely to enhance learning.

Retention

Observational learning cannot occur if what is observed is not remembered. In order to reproduce the modeled behavior when a demonstration is no longer available, the observer must retain the original observed stimuli in some symbolic form. According to Bandura (1986), the retention subprocess involves two symbolic or representational systems, the imaginal and the verbal. Some modeling stimuli are retained in relatively enduring, retrievable images of the modeled behavior. Such images--for example, the components of a golf swing--frequently include information about spatial and temporal coordinations that would be difficult to describe verbally. However, most of the cognitive processes which regulate behavior are primarily verbal rather than visual. Verbal coding of observed events probably accounts for the notable speed of observational learning and the long-term retention of modeled behavior. Verbal codes facilitate retention because they contain a great deal of information in easily stored form. Both representational systems are usually involved in retention to some degree (Paivio, 1985). Images are often verbally labeled, and words may elicit related imagery. The integration of the information of the two modalities into a common conceptual representation probably occurs frequently.

Bandura (1986) contends that the existence of the symbolic representation is of far greater importance than its modality. Observers who do not transform the modeled behavior into either a verbal or visual cognitive conception are at a disadvantage in modeling situations.

As complements to these symbolic coding operations, organization and rehearsal of the observed stimuli help to stabilize and strengthen the acquired responses and facilitate their retention. According to Bandura (1986), the level of observational learning can be greatly enhanced by practice or overt rehearsal of the modeled response sequences. Through physical practice the observer is able to organize and verify what is known and focus attention on difficult elements in subsequent demonstrations. The cognitive representation can thus be refined.

Covert, mental, or cognitive rehearsal may similarly increase retention of the observed behavior. Cognitive rehearsal seems to aid retention as a result of the observer's ability to organize the modeled behavior into meaningful units rather than from sheer repetition of the material. Complex activities that involve extensive cognitive processing seem to benefit more from mental rehearsal than do simpler skills (Feltz & Landers, 1983). Furthermore, learners with experience and skill in the specific activity seem to benefit more frc cognitive rehearsal than do those learners with less proficiency (Bandura, 1986). An understanding of the processes involved in acquiring the skill and the ability to execute the component movement skills seem to be necessary for cognitive rehearsal to be an effective aid to retention.

Motor Reproduction

The motor reproduction subprocess of social cognitive theory (Bandura, 1986) converts the symbolic representations into actions. Responses are selected and organized at the cognitive level. Then they are initiated, monitored, and refined on the basis of informative feedback. An accurate cognitive representation is necessary because it serves as the internal conception for production of the behavior and for correction of performance errors. Inadequacies in the cognitive representation will likely result in inadequacies in overt performance.

The amount of observational learning that will be exhibited behaviorally also depends on the availability of component movement skills. If the observer does not have the motor capacity to reproduce the coded act, accurate behavioral reproduction will not be possible. Inadequacies in motor abilities may reflect physical limitations or inexperience.

The observer's ability to interpret the feedback received from the overt performance and to compare it appropriately with the cognitive representation is another factor affecting the motor reproduction subprocess. The feedback may be intrinsic, resulting from the observer's own sensory perceptions of the action, or it may be provided by outside sources such as videotape recordings of the behavior or verbal information from an instructor. In either case, the observer must be able to recognize deficiencies in the performance-conception relationship in order to produce change. Corrections to the cognitive representation, the physical performance, or both may be required.

Motivation

The motivation subprocess focuses on such things as extrinsic and intrinsic reinforcements provided to the observer as well as on the various reinforcements provided to the model--that is, conditions that motivate the observer to reproduce the modeled response. Although an observer may accurately attend to the relevant stimuli of the modeled behavior, successfully encode and retain the necessary features of the act, and possess the required response components for performing the observed response accurately, it is still possible that the modeled act may not be reproduced because the observer has no incentive to do so.

Summary

Modeling is a multiprocess phenomenon. Consideration of the subprocesses governing this mode of movement instruction is essential if desired modeling effects are to be achieved. Bandura's social cognitive theory (1986) postulates that failures in observational learning may occur as a result of deficits in attentional skills, retention strategies, motor production capabilities, or motivation. The abilities of the observer in all four interrelated subprocesses must be recognized and addressed for adequate response acquisition and appropriate performance reproduction to occur.

Evaluating Learning in Motor Skill Modeling

Bandura (1986) postulated that response acquisition and performance reproduction are two separate but interrelated phases of the observational learning process. Skilled motor performance relies initially on a clear and accurate cognitive representation of the demonstrated behavior, formed as a result of the attentional and retention activities of the observer during response acquisition (Carroll & Bandura, 1990). Bandura (1986) also stated that "within the information-processing framework, learning is characterized as the acquisition of knowledge and cognitive directives for how to do something" (p. 107). The cognitive representation developed during response acquisition appears to reflect learning under this definition.

However, an accurate cognitive representation alone does not ensure skilled overt performance (Bandura, 1986). Unless the observer also possesses the motor skill abilities to successfully replicate the actions of the behavior and is motivated to do so, the physical performance may not match that of the demonstration. Performance reproduction requires the development of the physical skills and conception-matching abilities needed to implement the learning that has occurred. According to Bandura, the two phases of observational learning enhance each other during early stages of skill development: response acquisition (learning) guides actions, and performance reproduction (performance) provides informative feedback to perfect the quality of the cognitive representation.

In spite of the strong arguments presented by Bandura (1986) for the two phases of observational learning, most of the research in motor skill modeling has inferred learning from overt performance alone. If a critical portion of the modeling process is cognitive, it seems obvious that more should be known about those aspects that influence initial learning and, ultimately, the final performance.

Inadequacy of Evaluating Observational Learning by Performance Scores Alone

Adams (1987) said that there is a need to measure learning, as reflected by the cognitive representation, independently and then relate it to the physical performance. The motor behavior literature supports this assertion by pointing out possible deficiencies of overt performance scores as measures of learning. For example, performance evaluated only as it occurs concurrently with the model's demonstration may be only mimicry with little or no learning taking place. If the model is removed and performance is reevaluated, a decrease in performance accuracy is common, indicating a lack of actual learning (Carroll & Bandura, 1987; Newell, Morris,

& Scully, 1985). Another illustration of an outcome score being an inappropriate reflection of learning occurs when a novice performer is able to achieve the end result of a movement skill (e.g., putting the basketball through the hoop) even though the relative motions are incorrect. Sculley and Newell (1985) state that, to be useful, the primary function of a demonstration should be to facilitate acquisition of the movement pattern. Production of the end result of the action should be of secondary importance. Therefore, measurement of the end result or performance outcome would not necessarily be a true indicator of the learning that occurred from observing the demonstration.

On the other hand, observers may be able to acquire information (learn) from a demonstration but not be immediately able to produce the appropriate action (perform). Martens, Burwitz, and Zucherman (1976) found that, although strategies had obviously been learned from the demonstration, outcome scores in early performance trials on a "shoot-the-moon" task were low. These researchers concluded that complex motor skills may require some initial practice and development of skill before certain modeled components can be perceived in the performance. From the results of their research, Feltz (1982) and McCullagh (1987) suggested that a movement component--for example, form in a Bachman-ladder balance task--may be a better indicator of observational learning than are performance scores on the task itself. In view of conclusions such as these, it seems obvious that outcome or performance scores alone may not adequately assess observational learning in motor behavior. Adams' (1987) desire for a separate measure of response acquisition appears justified.

A further concern is that overt performance measures provide little or no indication of where learners' difficulties arise in the modeling process. Inaccurate motor responses may result from a variety of inadequacies within the process. For example, observational learning may be incomplete because important dimensions such as pressures, muscular tension, or some external features of the movement may not even be available to the observer's view (Adams, 1984; Bandura, 1986). In such cases, the reproduced movement will be imperfect because the cognitive representation is incomplete. The cognitive representation may also be incomplete if the observer's ability to selectively attend to relevant cues in the demonstration is inadequate or if the observer does not use effective strategies to facilitate retention of the perceived cues (Bandura, 1986). In other situations, performance scores may be low even though the cognitive representation is complete. A lack of the required component movements in the observer's repertoire may account for these poor outcome scores (Erbaugh, 1985). Alternatively, observers may have a very accurate cognitive representation of the demonstrated behavior and may also be quite capable of producing the required movements but simply do not imitate the actions because they are not motivated to do so (Bandura, 1986). Performance reproduction scores may not isolate these difficulties in the observational learning process. Findings such as these provide further support for the belief that response acquisition should be separately assessed and then related to performance reproduction.

An Independent Measure of Response Acquisition

Carroll and Bandura (1982, 1985, 1987, 1990) suggested a procedure for measuring the cognitive acquisition of a modeled skill that may be more effective than inferring learning from performance scores. A video demonstration of a complex sequence of nine arm positions was shown to undergraduate university students. In addition to producing the demonstrated actions physically, the subjects performed two other tasks. For the recognition task, a set of four still photos, including a component action and three similar distractors, was created for each of the nine arm positions in the sequence. Subjects were required to select from each set the photo that correctly represented the action in the sequence. For the pictorial-arrangement task, subjects were shown nine photographs representing, in scrambled order, the nine positions of the modeled sequence. Subjects were instructed to arrange these photographs from left to right into the order in which they appeared in the video demonstration. The accuracy of the recognition and pictorial-arrangement tasks were considered to be measures of the accuracy of the cognitive representation and, therefore, indications of the learning that had occurred.

As predicted, Carroll and Bandura found that physical reproduction of the movement pattern (performance) was positively correlated with accuracy of the pictorial-selection and -sequencing tasks (learning). They reported (1985, 1987, 1990) that correlations between component recognition and performance accuracy ranged from $r = .34$, $p < .05$ to $r = .47$, $p < .005$. Correlations between sequencing accuracy and performance accuracy ranged from $r = .42$, $p < .001$ to $r = .73$, $p < .001$. Apparently, the more accurate the cognitive representation, as measured by pictorial-selection and -sequencing tasks, the more accurate the physical replication of the demonstrated movements. These researchers believe that their technique is an appropriate method of measuring response acquisition independently of performance reproduction.

Similar pictorial-resequencing tasks have been used by other researchers. For example, Vickers (1986, 1988) assessed expert-novice differences in the ability of young subjects (M age = 13 years) to understand the serial organization of complex movement sequences (gymnastics skills). She concluded that the resequencing task can be a useful tool in assessing cognitive differences that may affect an athlete's ability to acquire a complex physical skill. Stafford (1988) replicated

Vickers' study with children from grades four to six (9 to 11 years old) and suggested that greater success on the resequencing task reflected the increased domain-specific knowledge of the children experienced in gymnastics skills. The cognitive activities of younger children (ages 5 to 11) have also been studied with procedures such as these. Cantor, Andreassen, and Waters (1985) found that the task of selecting and arranging pictures appeared to be successful in assessing differences in children's use of cognitive strategies for remembering sequential visual information.

Using a procedure directly related to that of Carroll and Bandura (e.g., 1982), Downey (1988) concluded that the ability to select and arrange still photos to represent observed movement sequences reflected age-related differences in response acquisition in a modeling situation. Her subjects, five to eleven years of age, observed videotaped movement sequences of eight dance-like actions. Following the third viewing of each sequence, the children were asked to (a) select from a field of 12 the eight photos that represented the movements of the sequence and (b) arrange them in order to represent the observed sequence. As in the Carroll and Bandura studies (1982, 1985, 1987, 1990), the accuracy of the selection and arrangement of the eight pictures of the movements of the sequence was considered to be a reflection of the cognitive representation formed during the response acquisition phase of the modeling process.

The pictorial-resequencing task may also help researchers examine variations in the thought processes of observers as they reconstruct a movement sequence from their symbolic representation of the behavior. In a qualitative analysis of their subjects' responses during the resequencing task, Downey and Neil (1989) considered patterns that appeared in the children's pictorial arrangements, spontaneous verbalizations of the children during the task, and general observations of the children's behavior and attitude toward the task. The effects of visually dynamic actions (e.g., kicks or large arm movements) on recall of the series, the subjects' recognition of organization patterns within the sequences, the use of grouping strategies and other coding and rehearsal activities by the children, and variations in the subjects' approaches to the resequencing task itself were noted. Results indicated age-related differences in all of these areas which reflect cognitive processing. In future research, a more stringent examination of (a) subjects' approaches to the resequencing task and (b) the response patterns that appear within the pictorial arrangements--perhaps supplemented by verbal reports collected concurrently with the resequencing task (Bandura, 1986; Ericsson & Simon, 1980)--may provide further insight into the cognitive activities of observers during the modeling process.

Summary

If there are distinct phases within the observational learning process (Bandura, 1986), then those phases should be investigated independently. Recent research has suggested that it is possible to evaluate the learning that occurs from observing a motor skill demonstration with procedures that do not require performance of the demonstrated skill by the observer. Comparison of this measure of the cognitive representation acquired during response acquisition with an overt performance by the learner should contribute to a better understanding of the observational learning process.

Overview of Research in Selected Aspects of Motor Skill Modeling

Although demonstrations are used frequently in teaching motor skills, research into observational learning in motor behavior has not been particularly extensive (Adams, 1987). Systematic research in the field has occurred primarily since 1970, and investigators have approached the phenomenon from a variety of perspectives. While this has provided insight into some of the many aspects of this complex phenomenon, much is still poorly understood (Adams, 1987). Some of the questions that have been considered thus far relate to the general effectiveness of demonstrations in motor skill acquisition, the relative importance of the informational and motivational components of the modeling phenomenon, and model and task characteristics that influence modeling effects. This section summarizes these areas of research.

Effectiveness of Demonstrations

Assessment of the general effectiveness of demonstrations in the motor skill acquisition process has appropriately been a focus of several investigations. Obviously, if modeling is to be considered as one method for learning a movement pattern, its usefulness must be shown. Some studies have indicated that modeling is only partially effective and is dependent on other variables such as observer, model, and task characteristics or on added motivational factors (Erbaugh & Barnett, 1986; McCullagh, Stiehl, & Weiss, 1990; Thomas, Pierce, & Ridsdale, 1977; Weiss, 1983; Weiss & Klint, 1987). However, most of the literature suggests that observing a demonstration of a novel motor skill facilitates performance by the learner (Anderson, Gebhart, Pease, & Ludwig, 1982; Feltz, 1982; Feltz & Landers, 1977; Landers, 1975; Landers & Landers, 1973; McCullagh, 1987). Demonstrations interspersed with physical practice appear to result in les error and less variability of response than if physical practice is used alone (Ross, Bird, Doody, & Zoeller, 1985). Observing a correct model throughout the acquisition period apparently produces a strong cognitive representation. From that symbolic representation, the learner may be able to identify and retain appropriate response specifications with greater accuracy than is possible with the conventional knowledge of results approach to skill acquisition (Bird & Rikli, 1983; Ross et al., 1985).

Informative Versus Motivational Aspects of Modeling

Bandura said that "modeling influences operate principally through their informative function" (1974, p. 16). At the same time, he included motivation as a subprocess of observational learning, deeming it necessary for imitation to occur at all. Consequently, the relative importance of the informative and motivating elements of the modeling process has been a focus for some researchers in motor behavior. Results have consistently shown that the informational component of a model's demonstration is the primary element affecting motor skill acquisition as measured by motor performance (Bird & Rikli, 1983; Feltz & Landers, 1977; Landers, 1975; Landers & Landers, 1973; Martens et al., 1976; Ross et al., 1985). Motivational aspects of demonstrations appear to be more difficult to assess than informational elements, and the findings related to motivation have been inconclusive (Erbaugh & Barnett, 1986; Feltz & Landers, 1977; Landers, 1975; Landers & Landers, 1973). In many of these studies, the motivational component of the demonstration appeared to be related to characteristics of the model.

Effects of Model Characteristics on Observational Learning

Model characteristics that seem most likely to affect observational learning are those that the observer expects to be important to successful task completion in terms of either the final product or the learning process. Model status, defined by the observer's perception of the skill level and/or social position of the model relative to the observer, has been shown to influence modeling effects, although it is not always clear whether it is the attentional or the motivational subprocess of modeling that is involved (Adams, 1986; Brody & Stoneman, 1985; Gould & Weiss, 1981; Landers & Landers, 1973; Martens et al., 1976; McCullagh, 1986, 1987; Ross et al., 1985). The gender of the model may interact with other variables, and its effect on observational learning may be understood most clearly by considering all aspects of the learning process rather than simply the performance product (Anderson, Gebhart, Pease, & Rupnow, 1983; Del Rey, 1978; Weiss, 1983). Models who verbally label the demonstrated movements may be particularly effective, especially with young children (Weiss, 1983; Weiss & Klint, 1987). Finally, live and symbolic models (presented on film or videotape) may be equally effective at conveying task relevant information (Bandura, Ross, & Ross, 1963; Feltz & Landers, 1977; Feltz, Landers, & Raeder, 1979; Maccoby & Sheffield, 1961; McCullagh, 1986). However, a personal involvement of the model with the observer may prove more beneficial to learning and performance in situations where the observer requires motivational support to imitate the behavior (Feltz et al., 1979; McCullagh, 1986). Obviously, model characteristics must be considered carefully in order to establish effective observational learning experiences.

<u>Effects of Task Characteristics on Observational Learning</u>

Sheffield (1961) maintained that the effects of modeling are largely task specific. In particular, task complexity appears to be a key factor influencing the success of demonstrations in enhancing motor skill acquisition. Unfortunately, it is hard to define relative task complexity because perceptual, cognitive, and movement aspects of the task all contribute to what behavior the learner reproduces following a demonstration (Carroll & Bandura, 1985; Downey, 1988; Gould, 1978; Martens et al., 1976; McCullagh, 1987; McCullagh et al., 1990). In spite of this difficulty, some general conclusions have been made. Modeling appears to facilitate performance (a) on early practice trials for motor tasks where the cognitive component is low and (b) throughout the performance trials if specific strategies are required or if the task involves the acquisition and sequencing of complex response components. In addition, novel movements within the task may inhibit modeling effects, at least in the early stages of skill acquisition (Downey, 1988; Feltz & Landers, 1977; Gould, 1978). Finally, for tasks where quality or form is important, observing a model may enhance performance (Feltz, 1982; McCullagh, 1987; McCullagh et al., 1990). Careful attention to the potential effect of task variables, particularly those that reflect complexity, is of utmost importance to an appropriate application of demonstrations in motor behavior.

Summary

The literature clearly supports the belief of most movement educators that modeling is an effective method of conveying task relevant information to the learner in motor skill acquisition settings. At the same time, there appear to be complex interactions involving motivation and model and task characteristics that influence the modeling process.

Of additional concern are the varied characteristics that the observer/learners bring to the experience and the potential effects of those characteristics on the observational learning process. This issue will be addressed in the following sections.

Effects of Age and Gender of the Observer on Observational Learning

Successful learning experiences focus on the abilities and needs of the students. Therefore, understanding how the characteristics of the observer/learner interact with the modeling experience seems critical. Because social cognitive theory (Bandura, 1986) describes observational learning in terms of the involvement of the observer, it seems clear that observer differences in any of the subprocesses of the theory may result in variations in the effectiveness of the experience. That is, variations in the overt performances of a group of observer/learners may be a reflection of differences in attention, retention, motor reproduction, or motivation, or in any combination of the four subprocesses. Two factors that may contribute to these variations are discussed in this section under the headings of age and gender of the observer.

Age of the Observer

Much of the literature on modeling in motor skill acquisition deals with homogeneous groups of adult observers (Bird & Rikli, 1983; Carroll & Bandura, 1982, 1985, 1987, 1990; Doody, Bird, & Ross, 1985; Feltz et al., 1979; Gould & Weiss, 1981; McAuley, 1985; McCullagh, 1987; Ross et al., 1985). However, it is recognized that psychological processes and theories that have been based on research with adults do not necessarily transfer to younger age groups (Gould, 1982). Therefore, some researchers have examined age-related differences in responses to demonstrated behavior and recently have become concerned with both learning and performance in observational learning.

Age effects on response acquisition. To investigate response acquisition, Downey (1988) assessed the accuracy of the cognitive representations which children formed as a result of observing a demonstrated movement pattern. Results indicated a significant effect of age on the scores that reflected the cognitive representation among all four age groups tested (five, seven, nine, and eleven years). She concluded that the ability to acquire information from a demonstration increased with age for the age range studied.

Response acquisition in observational learning includes the subprocesses of attention and retention (Bandura, 1986). Attentional processes have been shown to be developmentally sensitive (Newell & Barclay, 1982) as have retention processes including labeling, organization, and rehearsal (Gallagher, 1984). Hence, age-related differences that occur in observational learning may be due partially to the effectivenes with which children use these cognitive control processes or strategies to acquire information from the demonstration (Gallagher & Hoffman, 1987). These strategies in turn may reflect the extent of the children's knowledge about the task (Chi & Ceci, 1987), which may be expected to expand with age. The result of an ineffective use of the necessary cognitive processes during response acquisition may be an incomplete or inaccurate cognitive representation of the demonstrated behavior.

Weiss and Klint (1987) and McCullagh et al. (1990) offered further support for this apparent effect of memory development and information-processing capability on observational learning. In the Weiss and Klint study, older children reproduced an observed movement sequence better than younger children, even though all had been pre-tested to see that their abilities to perform the component movements were similar. The older children also exhibited spontaneous overt attention and retention strategies during the study, and they were able to relate numerous varied strategies that they had used or could have used to learn the required movements. The younger children did not exhibit similar overt learning strategies, and their ability to suggest such strategies was limited. McCullagh et al. (1990) found that older children were better than younger children at recalling both the sequential order and the form of the movements within a demonstrated movement sequence. For both studies, the researchers concluded that cognitive-developmental differences influenced observational learning. Although the findings of these studies were based on the children's physical performances, the observed age-related differences apparently affected response acquisition.

Age effects on performance reproduction. Other research with children in modeling experiences generally has shown a significant effect of age on overt performance, the product of performance reproduction (Bandura, 1977). Pertinent studies have compared five- and eight-year-olds, seven- and nine-year-olds, six- and nine-year-olds, eight- and thirteen-year-olds, and elementary school and university students (Anderson et al., 1982; Anderson et al., 1983; Feltz, 1982; Martens et al., 1976; McCullagh et al., 1990; Thomas et al., 1977; Weiss, 1983; Weiss & Klint, 1987). Performance scores have also shown interactions of age with other variables such as (a) presence of a model (i.e., demonstration versus no demonstration) (Anderson et al., 1982), (b) type of model (Weiss, 1983), (c) gender of the observer (Anderson et al., 1983), (d) temporal placement of the demonstrations within the learning process (Thomas et al., 1977), (e) presence of verbal rehearsal (McCullagh et al., 1990), and (f) trial block (i.e. acquisition vs. transfer) (McCullagh et al., 1990). However, no interaction between age and the number of practice trials was found in a comparison of elementary school and university students on a Bachman-ladder balance task (Feltz, 1982). Similarly, no interactions among age, gender, and instructional type were found when comparing the performance of six- and nine-year-olds on a motor skill sequence (Weiss & Klint, 1987).

The results of the studies that have used a physical performance by the observer to evaluate developmental differences in observational learning might be explained by variances in attention and retention, as discussed previously. However, motor performance has also been found to improve with age (Thomas, 1980). Physical growth and biomechanical and physiological factors are most frequently mentioned in the motor development literature as contributors to this change in performance. Furthermore, it is assumed that older children would have had more opportunities than young children for varied motor skill activities; the older learners' performance levels would be expected to be higher as a result. In addition to improvements in motor performance, an increased understanding of the consequences of imitiating modeled behavior comes with maturation (Bandura, 1977). The result of this understanding is that the motivation to reproduce the observed action is likely to change with age-related development. Hence, even though age-related performance differences were found in these investigations, it is not clear which of the subprocesses of the modeling process may have been responsible for the variations.

Summary of age effects. To structure effective observational learning experiences for varied ages, all four subprocesses of Bandura's theory--attention, retention, motor reproduction, and motivation--must be considered in relation to the developmental level of the learners. A weakness in any area may result in incomplete learning and poor performance.

Gender of the Observer

Whatever teaching technique is used, it is frequently assumed that gender differences will affect the student's ability to learn and perform certain movement patterns. This is especially true for stereotypically "female" or "male" activities. However, in the motor behavior literature concerned with modeling, very limited attention has been paid to questions related to gender of the observer. In fact, many studies have avoided the issue by using only single sex subjects (Downey, 1988; Feltz et al., 1979; Martens et al., 1976; McCullagh, 1987).

In studies that have considered gender of the observer, several hypotheses have been proposed to explain differences that have been found. Erbaugh (1985) suggested that response differences between the sexes may have resulted from the subjects' lack of the movement responses needed to produce the behavior rather than from a lack of learning. In another study, performance differences that might be interpreted as an interaction between sex and age of the observer may have resulted instead from the model's expectations of the learners' responses (Anderson et al., 1983). Several researchers have suggested that differential movement experiences of males and females and stereotypically male/female behaviors may explain the gender differences found in studies of modeling in motor performance (Anderson et al., 1983; Bandura, Grusec, & Menlove, 1966; Del Rey, 1978).

The issue of assessing observational learning based on performance measures alone may be a confounding factor in these studies. Gender differences across age in motor performance are known to exist as a result of biological and environmental factors (Thomas & French, 1985). However, no clear description of gender differences in response acquisition during observational learning has been shown.

A better understanding of how the gender of the observer influences the two phases of the modeling process seems necessary. Then the effect of inherent or experiential gender factors on observational learning might be determined more accurately. More appropriate teaching and learning might be expected.

Summary

Both age and gender of the observer seem to have the potential to alter the success of motor skill modeling experiences. All four subprocesses of Bandura's theory appear to be susceptible to their influences. Furthermore, it has been suggested that prior experiences and domain-specific skill may contribute to observational learning variances attributed to the age and/or gender of the observer. Hence, the effect of previous observer experiences should be examined.

Potential Effects of Prior Experience and Skill Level of the Observer on the Observational Learning Process

The observer's exposure to previous movement experiences similar to the demonstrated skill may affect the observational learning process. Tasks with which the observer has had considerable experience may require little processing of specific information. Consequently, modeling effects may not be apparent (Anderson et al., 1983) or may be apparent only in the early stages of learning (Martens et al., 1976). On the other hand, some degree of expertise with the task may be required for modeling to be effective at all. Learners who have had no experience with a demonstrated task may be unable to acquire the appropriate information from the model and/or reproduce the behavior accurately (Bandura, 1986; Martens et al., 1976).

This section begins with a general discussion of the relationship of experience to the knowledge base. Summaries of findings related to expertise in cognitive activities and sport skills follows. Finally, the relationship of the observer's prior experience to the observational learning process is considered.

The Knowledge Base

Differences due to experience and skill level are generally attributed to the underlying knowledge base of the learner. Both the quantity of the information available in the knowledge base and the structure of its symbolic representation are important (Chi & Ceci, 1987). The structure of a representation may refer to the degree of organization within the representation, which can be quantified, or it may be a more qualitative characteristic appearing in the way knowledge is used in performing a task. According to Chi and Ceci (1987), the structure of a representation may be thought of in terms of three aspects of its content: (a) the number of accessible concepts in the representation, (b) the available number of attributes related to the concepts, and (c) the number of links that the individual has between the concepts and their attributes. Definition of a representation's structure may also include the mode of its internal code. Internal representations are generally believed to be in the form of either images or verbal equivalents of the information (Bandura, 1986; Paivio, 1986). It is generally assumed that with experience the knowledge base expands (Lindberg, 1980; Wall, 1986). That is, the concepts and conceptual attributes of the representation increase, and more links connecting the knowledge components are acquired. An enriched knowledge base allows the learner access to larger and better organized sources of information in long term memory (Chi & Ceci, 1987; Thomas, 1980). As the knowledge base in a domain expands and expertise develops, performance becomes more consistent and accurate with its component elements integrated to form a coherent whole (Chi & Glaser, 1980). In addition, the individual is able to learn better from experience, apply rules appropriately, and rely on internal symbolic strategies and standards of performance. At all ages, memory performance improves when content and strategic knowledge increase as a result of experience (Chi, 1981).

Investigations concerned with the knowledge base, its structure and ways in which experience influences its change, frequently utilize an "expert-novice" paradigm. Experts are people who possess a considerable degree of domain-specific knowledge, whereas novices have a limited amount of knowledge in the domain. Performances of the two groups are compared to determine differences in the way knowledge is represented, information processed, and problem solving approached (Thomas, French, & Humphries, 1986).

Expertise in Cognitive Tasks

The classic study of expertise in chess by Chase and Simon (1973) seems to have laid the foundation for much of the following expert/novice research. After a 5-second exposure to a chess board set-up, no significant differences in the amount of information recalled were found among the skill levels tested. However, the Master chess player was superior to the A-level player who was superior to the novice in speed of perception of chunks (chess board positions), in apparent sophistication of chunking (associated with knowledge of plays), and in recall of board patterns which conformed with actual game positions. Similar studies of other cognitive tasks such as computer programming (McKeithen, Reitman, Rueter, & Hirtle, 1981), chess play by children (Chi, 1978), physics problem solving (Chi, Feltovich, & Glaser, 1981), musical notation recall (Sloboda, 1976), bridge play (Charness, 1979), and the board game GO (Reitman, 1976), also concluded that domain-specific knowledge accounted for the better performances exhibited by the experienced subjects. Apparently, experts have access to more concepts with more defining features within each one (Thomas et al., 1986). Furthermore, experts seem to have a system of procedural knowledge, "how to do" information, which they use to form abstract plans for solving problems. Novices tend to develop more concrete representations in problem-solving situations. Interestingly, experts may be unaware of the processes through which they use their procedural knowledge to perform the task (Adelson, 1984).

Considering the effect of sport expertise in a cognitive task, Chiesi, Spilich, and Voss (1979) and Spilich, Vesonder, Chiesi, and Voss (1979) defined the structure of the knowledge base from a somewhat different perspective. They proposed that the organization of a sport knowledge base involves the game's goal structure, game states and actions, and the setting of the game (Thomas et al., 1986). The goal structure of a sport such as baseball is seen as hierarchically organized. The critical knowledge relates to attaining the highest goal of the game (e.g., winning the game). This knowledge includes the ability to analyze sequences of game states and employ appropriate game actions. Game states define the conditions in a game at a specific time. Game actions occur during the game to create changes in game states.

Using this framework, Chiesi et al. (1979) and Spilich et al. (1979) studied individuals with high and low levels of knowledge about baseball. Their results support other cognitive studies. High-knowledge persons appear to have more and larger chunks of information in their domain-specific knowledge base, and in the area of sport expertise, that information tends to be organized within the goal structure of the game. In addition, high-knowledge individuals process input information relevant to the goal structure of the game by monitoring game states and actions and selectively processing appropriate stimuli.

In summary, expert/novice differences in cognitive tasks seem similar across a wide variety of knowledge domains, including knowledge of sports. Experts appear to have superior networks of declarative knowledge and systems of procedural knowledge that enable them to use their declarative knowledge more effectively than novices (Thomas et al., 1986).

Expertise in Sport Skills

Research to investigate the contribution of the knowledge base to motor skill performance has been conducted only relatively recently (Allard & Burnett, 1985; Thomas et al., 1986). However, it already seems apparent that there are many similarities between sports experts and experts in cognitive tasks. Skilled athletes are not necessarily superior due to superior nervous systems, as previously assumed, but rather seem to have developed advanced forms of declarative and procedural knowledge related to their sports (Starkes, 1987).

Studies have been conducted with expert and novice performers in basketball (Allard, Graham, & Paarsalu, 1980; French & Thomas, 1987), volleyball (Allard & Starkes, 1980; Starkes & Allard, 1983), tennis (Jones & Miles, 1978; Isaacs & Finch, 1983), badminton (Abernethy, 1988; Abernethy & Russell, 1987), field hockey (Starkes & Deakin, 1984), and ice hockey (Salmela & Fiorito, 1979; Thiffault, 1974). In a review of much of this literature, Starkes and Deakin (1984) state that "the interaction between level of skill and processing of game structured information appears to be a robust finding" (p. 124). An experienced individual who has developed an enriched knowledge base in a sport domain has access to more and better information in long-term memory. This information allows the performer to select relevant cues from the environment, quickly process the input for appropriate response selection, and develop and use sport-specific strategies to assess and act upon changes within the game's structure (Thomas et al., 1986).

Most research concerned with the cognitive aspects of sport skills has involved activities frequently classified as "open skills". Poulton's (1957) taxonomy of open and closed skills is subject to considerable debate. Activities fall on a continuum between the two extremes (Gentile, 1972), many skills seem to exhibit features of both categories, and "pure" open or closed skills are difficult to define. However, Allard and Burnett (1985) suggest that the distinction, inadequate as it may be, can be helpful in assessing differences in the cognitive demands placed on skilled athletes in various activities.

Open skills occur in moving, changing environments, and, according to Allard and Burnett (1985), their goal is to produce a specific event in that environment (e.g., putting the ball through the hoop, placing a tennis shot out of reach of the opponent). The movement involved is simply one way of achieving the goal. Closed skills, on the other hand, occur in relatively static environments and include activities such as gymnastics and figure skating routines, diving, and some forms of dance. For these nonmanipulative closed skills, the primary goal is to produce an "ideal" motor pattern. The movement <u>is</u> the skill. Allard and Burnett state that for athletes in closed skills, attention is primarily focused internally, as the performer attempts to match performance with a conceptual ideal. In contrast, open-skill athletes must maintain a primarily external focus, monitoring environmental changes and adjusting performance as the situation requires.

The cognitive demands on athletes in open and closed skills appear to be quite different. The problem solving and strategy use that are typical in open skill sports seem to relate them closely to other knowledge domains, such as chess. Indeed, the cognitive skills of experts in open-skill sports have been shown to be similar to those of experts in other domains (Deakin & Allard, 1991). In contrast, closed skills do not rely heavily on stategy use and problem solving. Dance, gymnastics, and figure skating require consistent, accurate performance, frequently based on the recall of a highly detailed and extensive set of movements comprising a routine. Although of a different nature, expert-novice differences might well be expected to appear in the cognitive aspects of closed-skill performances as well as in those of open skills.

Expertise in closed skills. Research concerned with the effect of experiential differences on closed-skill activities is limited. Five recent studies have been found. Vickers (1988) examined expert, intermediate, and novice gymnasts for differences in their knowledge structures. By assessing eye movements of the subjects, Vickers showed that the three groups attended to different aspects of modeled performances. A pictorial-resequencing task also used in the study indicated that the expert subjects were significantly faster and more accurate than the intermediates who were, in turn, significantly more skilled than the novices at reconstructing the sequential arrangement of gymnastic skills. Vickers suggested that these results indicated a basic cognitive difference among the groups that might influence their abilities to successfully perform the required skills.

Stafford (1988) replicated part of Vickers' study, using a pictorial-resequencing task to consider the effect of experience on the ability of 9- to 11-year-old children to recall novel sequences of gymnastic skills. There were no differences among the experience groups on their resequencing responses to an "everyday" sequence, and neither age nor grade in school affected resequencing performance. However, among all three levels of gymnastics expertise used in the study, significant differences were found on accuracy of recall of the gymnastics sequences.

Starkes and her associates (Starkes, Caicco, Boutilier, & Sevsek, 1990; Starkes, Deakin, Lindley, & Crisp, 1987) have studied expert-novice differences in two different styles of dance. Young ballet dancers (11 years old) were assessed on their verbal and motor recall of structured and unstructured ballet sequences presented via videotape (Starkes et al., 1987). There were no significant differences between the expert and novice groups on recall of the unstructured sequences. However, the skilled dancers were superior to the novices in both verbal and motor recall of the structured ballet sequences. This finding is similar to those of studies in other knowledge domains, including open-skill sports: experts typically recall more structured information related to their skill domain. In addition, the expert ballet dancers in this study apparently employed more than one coding strategy and recognized the value of mental rehearsal to aid retention, whereas the novices did not.

Results were somewhat different for the Starkes et al. (1990) study of creative modern dancers. Skill level did not interact with information structure. Instead, expert dancers recalled both the structured and unstructured sequences significantly better than did the novices. Apparently, modern dancers develop different types of memory structures to enable them to recall choreographies that are less strictly described than those typical of ballet. Self-generated recall strategies, including verbal labels for movements less specifically defined than in classical ballet, may be developed for use by dancers experienced in creative modern dance (Starkes et al., 1990).

In the final study, Deakin and Allard (1991) considered several questions concerning the memory skills of expert figure skaters. They concluded that (a) similar to experts in other domains, expert skaters recall more information from a brief exposure to domain-specific information than do less skilled skaters, (b) choreographed or structured skating sequences are recalled with greater precision by the experts than are nonstructured sequences, (c) expert skaters encode sequential skating information differently for performance than they do for verbal reporting, and (d) expert skaters appear to have a more accessible semantic memory for skating elements than do nonexperts. The authors summarized their findings by stating that skilled athletes in closed skills such as figure skating seem to exhibit similar cognitive skills to "experts in such domains as digit span (Chase & Ericsson, 1982) and recall of dinner orders (Ericsson & Polson, 1988)" (Deakin & Allard, 1991, p.86).

Summary. Expertise in sport skills appears to reflect differences in cognitive abilities that are domain-specific just as they are in other knowledge domains. Although the functions of those abilities may be quite different for open and closed skills (Poulton, 1957), experts in both benefit from an expanded knowledge base that enables them to perceive and interpret appropriate stimuli, process domain-specific information efficiently, and produce effective physical responses as needed.

Prior Experience and Observational Learning

Thomas et al. (1986) recommended that motor behavior research should be concerned with (a) how people learn sports in actual sport settings and (b) how accumulated experience influences the development of expertise in sport skills. Observational learning is one of the prominent ways in which new motor skills are learned and previously acquired skills refined. As described by Bandura's social cognitive theory (1986), observational learning involves extensive cognitive activity on the part of the observer/learner in addition to physical production of the actions. The effect of experience in a specific motor skill on the observational learning process involving that skill should be of interest to researchers concerned with motor skill acquisition and development.

Experts in a variety of sport skills have been shown to possess and utilize an expanded domain-specific knowledge base, enabling them to be more effective in their sport than less-skilled participants. Furthermore, variances in domain expertise have been shown to affect observational skills related to physical activity (Bard, Fleury, Carriere, & Halle, 1980; Imwold & Hoffman, 1983; Petrakis, 1986, 1987; Vickers, 1988). A logical hypothesis based on these findings from the expert/novice research in motor skills seems to be that the observer's prior related experience will indeed have an effect on the observational learning of movement behavior.

Knowledge base differences reflecting prior experience would be expected to affect the modeling process at several points. Differences in the observer's underlying knowledge base could account for differences in the ability to use control processes such as selective attention and retention strategies (Lindberg, 1980). With a knowledge base enriched by experience, individuals tend to know, or quickly recognize, relevant features of a demonstration and appropriately focus attention on those aspects (Newell & Barclay, 1982). Less knowledgeable learners may be expected to miss task relevant cues and focus on inappropriate features of the stimulus. Individuals who have an expanded source of organized information in long term memory are also likely to utilize effective organizational and rehearsal strategies to facilitate retention of the important elements of the task. Although task-specific strategies can be taught to inexperienced learners with a resultant improvement in performance, the spontaneous selection of appropriate strategies appears to require an adequate knowledge base in the skill (Gallagher, 1984). Therefore, the observer's knowledge base prior to the modeling task may affect observational learning through the control processes active in the attentional and retention subprocesses of social cognitive theory (Bandura, 1986).

The observer's knowledge base prior to the modeling experience may also affect performance reproduction. As a product of experience, an individual's knowledge about action generally includes procedural knowledge partially reflected by skill level (Wall, 1986). The skill level that individuals bring to an observational learning session may be expected to contribute to variances in motor reproduction. Although their cognitive representations formed during response acquisition might possibly be equally well-developed, novices and experts in a skill domain would be expected to perform the required movements with considerably different degrees of accuracy.

Furthermore, Martens et al. (1976) showed that complex skills may require physical practice before modeling effects can be seen in performance. In such situations, individuals who have a large repertoire of component movement skills to draw upon may improve their performance more quickly, even when learning (response acquisition) is no more complete than that of other observers. At the same time, if less information processing capacity is required for producing the movement, more may be available for response acquisition (e.g., encoding and rehearsing sequential information) (Deakin & Allard, 1991). In addition, previous successes are known to be effective motivators. Observers who have acquired knowledge related to the demonstrated task might be expected to have had positive experiences in similar tasks. Those experiences would be expected to act as motivators, promoting the imitation response. In summary, the observer's previous experience may influence observational learning in the motor reproduction and motivation subprocesses of Bandura's (1986) theory of modeling as well as in the attentional and retention subprocesses.

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Knowledge base differences resulting from experience have been found to affect performance on cognitive tasks and in sport skills. Considering that the research has been somewhat limited, expertise seems to be important for closed-skill activities as well as for open skills, although its

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Summary of the Discussion of Experience and Skill Level

Knowledge base differences resulting from experience have been found to affect performance on cognitive tasks and in sport skills. Considering that the research has been somewhat limited, expertise seems to be important for closed-skill activities as well as for open skills, although its application may be different. Furthermore, it seems likely that the observer's previous experience in a domain may affect observational learning in that domain at any of the subprocesses of the paradigm. The issue of domain-specific knowledge and its influence on observational learning warrants further study if motor behavior educators are to understand and utilize demonstrations effectively.

Conclusions and Rationale for the Current Research

Summary of the Review of the Literature

Most teachers and coaches recognize that the process of learning a motor skill and the final performance level achieved vary tremendously among learners. However, many do not understand why this is so in instructional situations where demonstrations are the principal means of communicating information to the student. Part of the responsibility for this lack of understanding resides with an insufficient research base concerning motor skill modeling.

Bandura's (1986) social cognitive theory has been the theoretical foundation for most research investigating this motor skill teaching technique. According to Bandura, observational learning occurs in two phases, response acquisition and performance reproduction, and requires an active involvement of the observer in each of the phases.

Knowledge of these two proposed phases and their separate yet interrelated influences on the modeling process seems to be critical to an appropriate interpretation of student skill acquisition. However, relatively little attention has been paid to the response acquisition phase (Bandura, 1986). Most studies in the motor behavior literature have measured the effects of modeling solely on an overt performance, inferring learning from performance reproduction. Such inferences may be misleading. To understand observational learning fully, researchers need to measure response acquisition (learning) and performance reproduction (performance) independently and then relate these two phases of the paradigm (Adams, 1987).

Assessing the accuracy of the cognitive representation through a pictorial-resequencing, recognition task has been proposed as a method of isolating the learning that has occurred during response acquisition (Carroll & Bandura, 1982). Physical performance of the behavior can then be compared to this measure of learning to help clarify the total modeling process, assuming that motivational levels of the subjects for the two tasks are similar. To date, studies using this assessment of response acquisition have involved either laboratory designed tasks or relatively short motor skill sequences (gymnastics skills or sequences of up to eight movements). No attempt has been made to use the pictorial-resequencing task to investigate the learning of longer movement sequences such as those involved in gymnastics, figure skating, or dance routines.

Although many factors have been shown to affect the modeling process, characteristics of the observer seem especially important and relatively unexplored. Traits such as age-related development, gender, and experience and skill level in the activity appear to be important learner variables that may influence both phases of observational learning. Because the experience and skill level of the observer/learner may contribute to both age and gender effects, this element of the observer characteristic variable seems particularly in need of examination.

Expertise in sport skills has been shown to resemble expertise in other knowledge domains. Sports experts seem to be able to utilize stimuli that is pertinent to their tasks, process information efficiently, recall relevant material with ease, and select appropriate motor responses when needed--in their specific sports (Thomas et al., 1986). Motor production advantages may also contribute to differences between expert and novice responses in motor skill activities (Deakin & Allard, 1991). However, the issue of expertise in the observational learning of motor skills has not been specifically explored.

Purpose of the Research

This thesis addresses several of the issues arising from the literature. Of primary concern was the need to enhance understanding of the total modeling process which is so universally employed in motor skill acquisition settings.

The initial goal was to develop and use independent measures of learning and performance in an observational learning situation involving an ecologically valid motor skill. Application of appropriate measuring tools was necessary to evaluate differences in observer/learner responses. The pictorial-resequencing task developed by Carroll and Bandura (1982) for assessing response acquisition was adapted for use with dance sequences like those taught in young adult courses. Performance reproduction was assessed via visual analyses of videotaped performances of the dances, using detailed descriptors of the component movements. Two different dance styles and subjects with two levels of dance expertise were used in the study. Finally, the relationship between learning and performance was investigated. Chapter 2, "Measurement of and Relationship between Response Acquisition and Performance Reproduction in Observational Learning of Dance", reports this study.

A second goal was to investigate the influence of domain-specific expertise on the two phases of observational learning, as defined by Bandura (1986). Expert-novice studies help to illuminate differences between skilled and beginning performers, enhancing our ability to interpret and direct student behavior in motor skill acquisition settings. When demonstrations are used as a teaching technique, domain-specific expertise might be expected to influence both learning and performance. Knowledge of the differences that might occur should help instructors of beginner, intermediate, experienced, or mixed student populations, enabling them to organize modeling experiences appropriately. In Chapter 3, "Expert-Novice Effects on the Two Phases of Observational Learning in Dance", expert and novice dancers of university age were assessed for their ability to learn and perform two dance sequences solely from demonstrations of each dance. The procedure utilized a realistic dance-learning task with respect to (a) sequence length and content and (b) the amount of time allowed for observing and practicing each sequence. Response acquisition and performance reproduction were measured via the pictorial-resequencing task and visual analyses of videotaped overt performances, respectively.

A third focus of the investigation was on the observational learning of dance by young adults having minimal dance backgrounds but considerable amounts of other motor skill experience. Although domain-specific expertise has been shown to affect many aspects of motor skill performance, there have been few attempts to assess the potential effects of high levels of general, or nondomain-specific, motor skill experience on the learning of a particular motor activity.

Questions arise concerning the generalizability of observational skills, the possible transfer of learning and/or performance skills between motor activities of various degrees of similarity, and the effects of particular types of experience--for example, teaching or coaching--on observational learning. Because teachers often face groups of students having variable backgrounds, a better understanding of the effects of previous motor skill experiences would be helpful. In "Effects of Varied Motor Skill Experience on the Observational Learning of Dance Sequences by Beginner Dancers" (Chapter 4), response acquisition and performance reproduction were assessed via the same methods used in previous studies. In addition, measurements were made both before and after a nine-week elementary dance course in which all of the subjects participated. Hence, changes in the nondancers' abilities to learn and perform dance through observational learning were also analyzed to see if varied prior experience affected the ability to learn the techniques used in the modeling process. The results of this study are partially descriptive, reflecting the preliminary nature of these considerations.

Instructors in motor skill acquisition settings must be equipped to use demonstrations appropriately. They must understand the influence of domain-specific and general motor skill experience on the total observational learning process. This research was designed to contribute to this understanding.

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CHAPTER 2

MEASUREMENT OF AND RELATIONSHIP BETWEEN RESPONSE ACQUISITION AND PERFORMANCE REPRODUCTION IN OBSERVATIONAL LEARNING OF DANCE

ABSTRACT

This study sought to develop instruments to measure and compare response acquisition (learning) and performance reproduction (performance) (Bandura, 1986) for an ecologically valid motor task. Forty university undergraduates of two levels of dance ability observed two dance sequences that were similar in length but different in style and complexity. They observed several demonstrations of each dance, arranged still prints of actions within the dances to represent learning, and danced each sequence to illustrate reproduction accuracy and movement quality. Results indicated that the measurement tools were appropriate for the tasks. Learning and performance were positively correlated but at a moderate level, suggesting the need for further research into the differences between the two phases of the modeling process. The findings permit further investigations of the dance observational learning process with this population.

MEASUREMENT OF AND RELATIONSHIP BETWEEN RESPONSE ACQUISITION AND PERFORMANCE REPRODUCTION IN OBSERVATIONAL LEARNING OF DANCE

Although demonstrations are widely used in motor skill instruction, observational learning is not always successful. Demonstrations may not produce the desired learner response, and teachers may not understand how to adapt the procedure to improve the experience. Adams (1987) contends that many aspects of the modeling process are still not clearly understood. In particular, two phases of observational learning need to be assessed independently, and their interrelationship in motor skill acquisition considered.

The two phases are described by Bandura's social cognitive theory (1986). Response acquisition occurs as the observer perceives, mentally codes, and rehearses the modeled behavior, transforming it into symbolic cognitive representations in the form of images and verbal equivalents of the actions. Subprocesses of response acquisition are attention and retention. Response acquisition reflects the information-processing concept of learning: "the acquisition of knowledge and cognitive directives for how to do something" (Bandura, 1986, p. 107). Performance reproduction, the second phase, includes the mental functions that use the covertly coded response to guide overt performance. Motor reproduction and motivation are subprocesses of performance reproduction, which reflects not only the knowledge of what to do but also the ability and desire to reproduce the behavior physically.

Most of the studies in the motor behavior literature have evaluated modeling effects by assessing overt performance. The learning aspect of the procedure, the mental functioning that results in a cognitive representation in memory, has generally been inferred from the physical performance and has received relatively little attention in investigations of skill acquisition (Bandura, 1986). However, overt performance scores may be misleading indications of learning. If performance is evaluated as it occurs concurrently with the demonstration, it may be only mimicry with little learning taking place (Newell, Morris, & Sculley, 1985). Performance may also reflect an end result (e.g. putting a ball through the basket) that is not necessarily founded on an accurate movement pattern. Acquisition of the movement pattern should be the primary goal of the observational learning process (Sculley & Newell, 1985). In addition, the overt performance may not reflect learning that <u>has</u> occurred if physical skills are inadequate for producing all aspects of the observed behavior (Feltz, 1982; Martens, Burwitz, & Zucherman, 1976; McCullagh, 1987). Adams' (1987) concern that response acquisition -- learning -- and performance reproduction-- performance -- need to be independently assessed and then compared seems justified.

An Independent Measure of Response Acquisition

Carroll and Bandura (1987, 1990) evaluated response acquisition with (a) a component-recognition task and (b) a pictorial-resequencing procedure that did not require physical replication of the observed action. A video demonstration of a complex action sequence of nine arm positions was shown to undergraduate university students. Subjects were then asked to (a) select still photographs of the correct component actions of the sequence from sets that included "highly-similar distractors" (1987, p. 390), and (b) arrange a scrambled set of photos of the nine correct actions into the order in which they appeared in the video demonstration. The accuracy scores of the component-selection and pictorial-arrangement tasks were considered to be measures of the accuracy of the cognitive representation and, therefore, indications of the learning that had occurred.

The researchers found that the measures of response acquisition were positively correlated with the accuracy of the physical reproduction of the movement pattern (performance). Correlations ranged from $r = .34$, $p < .05$, to $r = .73$, $p < .001$, in reported studies (Carroll & Bandura, 1985, 1987, 1990). In addition, causal analysis supported the proposal that the effect of multiple demonstrations and verbal coding on reproduction accuracy was "mediated by changes in the accuracy of cognitive representation" (Carroll & Bandura, 1990, p. 94). That is, cognitive representation, as assessed by pictorial-resequencing, had a significant effect on reproduction accuracy even when treatment effects (number of demonstrations and verbal coding) were statistically controlled. More importantly, the treatment effects disappeared when the effect of the cognitive representation was controlled. The recognition and sequencing tasks were deemed appropriate measures of response acquisition for the laboratory designed tasks of the Carroll and Bandura research. However, the investigators did not attempt to extend their findings to the observation of ecologically valid motor tasks.

Similar pictorial-resequencing tasks have been used by other researchers in studies of gymnastics (Stafford, 1986; Vickers, 1986) and dance (Downey, 1988). Conclusions suggest that the technique can be useful for assessing cognitive differences that may affect acquisition of complex physical skills. However, the studies by Stafford, Vickers, and Downey did not include an overt performance of the actions illustrated by the still pictures. Hence, no comparisons between the cognitive acquisition of the skill and its physical replication were made. Furthermore, relatively short motor skill sequences, up to eight movements, were used in these studies. Comparisons of response acquisition and performance reproduction in longer movement sequences--such as those of routines in gymnastics, figure skating, or dance--have not been made.

In summary, the pictorial-resequencing task provides an effective, independent measure of response acquisition in the observational learning of laboratory tasks and relatively short motor skill sequences. However, the task has not been used in longer, realistic movement sequences to (a) assess learning and (b) investigate the relationship between learning and physical performance . Its usefulness in modeling studies involving activities such as gymnastics, figure skating, or dance routines has not been determined.

Purpose of the Study

Thomas, French, & Humphries (1986) suggested that motor skill researchers should study how learning occurs in actual sport settings. Obviously, appropriate measuring tools are necessary to evaluate such learning.

The initial goal of this research was to develop and use independent measures of learning and performance in an observational learning experience involving an ecologically valid motor task. The pictorial-resequencing task developed by Carroll and Bandura (1982) for assessing response acquisition (learning) was adapted for use with dance sequences resembling, in both content and length, sequences taught in young adult courses. Performance reproduction was assessed via detailed analyses of the videotapes of subjects' overt performances. Two different dance styles and subjects at two levels of dance expertise were considered.

The second purpose of the study was to investigate the relationship between response acquisition and performance reproduction for this motor skill. It was hypothesized that response acquisition (learning), as measured by the photo-resequencing task, would be moderately positively correlated with performance reproduction of the observed behavior (dance performance) across ability levels and within each level.

Method

Subjects

Forty university undergraduates, ten experienced and 30 beginner dancers, served as subjects (Appendix A). The "experts" (nine females, one male; mean [*M*] age = 22.8 years) were dance majors at a university in Toronto, Ontario. They had an average of 11.1 years of dance experience with at least three years of intense daily training in varied dance forms. As members of the university's performing dance ensemble, they had been selected by audition as the most highly skilled amongst their peers. They were tested on two days at the end of March 1990.

The "novice" group consisted of 30 physical education majors (15 females, 15 males; *M* age = 22.4 years) enrolled in a folk dance course at an English university in Montreal, Québec. They earned credit for a portion of the course by participating in the study, but an alternative assignment was available for any class member not wishing to take part. The majority of these novice dancers ($\underline{n}$ = 21) had had only 26 hours of dance instruction in a basic rhythmics course at university, supplemented by small amounts of free-time social dance. Six of the remaining had had up to two years of either childhood ballet lessons or aerobic exercise participation. Only three had studied dance (classical ballet, jazz, or folk dance) for a longer period ($\underline{M}$ = 7.2 years). The novices were tested over a 10-day period in January 1990.

Modeled Behavior

Two 16-measure sequences, one of folk and one of jazz dance, were created for the study and demonstrated on videotape. The folk dance contained selected patterns from "The Shepherd's Crook" (Jensen & Jensen, 1966), a dance frequently taught to university students. The jazz piece was choreographed by the experimenter, who had had considerable experience teaching jazz dance to young adults. These sequences were designed to present variations in dance form and style, step patterns, movement difficulty, and sequence characteristics so that a meaningful range of learning and performance scores might appear. The folk dance was 26 seconds long, the jazz dance 31 seconds. Descriptions of the dance patterns and recording format appear in Appendix B.

The model was an experienced female dancer whose spatial orientation on the videotape was the same as that of the observer. Music was included as an integral part of each dance because it (a) frequently serves as an aid to retention for dancers who are able to use it appropriately (Starkes, Deakin, Lindley, & Crisp, 1987) and (b) required the participants to present their physical performances within a consistent temporal framework.

Procedures

All subjects were tested individually in dance studios at their universities with only the experimenter and videocamera operator present. A television monitor and VCR were positioned so that subjects could sit on the floor, stand, or move about while observing the demonstration. A table was provided for the resequencing task. On it was a large sheet of Bristol board, ruled lengthwise into four sections to guide subjects in placing the prints into quadrants representing four-bar musical phrases. Sufficient space remained on the table for the prints to be spread out for examination before sequencing. A video camera on a tripod was positioned to record subjects' physical performances, photo-resequencing procedures, and nonperformance behavior.

Prior to testing, subjects were informed that the purpose of the study was to investigate the effects of previous movement experiences on their ability to learn from a demonstration. The two phases of Bandura's (1986) theory were briefly explained so that the subjects would understand the reasons for the tasks they would perform. They were then told they would be asked to (a) observe and remember two separate dance sequences, (b) arrange a scrambled set of still pictures of the actions in each dance to show what they had learned from the demonstrations, and (c) dance the sequences. The print-resequencing task was demonstrated so that all subjects would place the prints on the answer card in positions related to the corresponding locations of those actions in the sequence, leaving spaces to indicate nonsequential prints (i.e., some actions missing). Subjects were encouraged to use whatever strategies would best help them learn the dances. Finally, they were told that their behavior would be videotaped to be analyzed later.

The testing pattern was illustrated on a blackboard, and the experimenter verbally cued each part of the procedure (Table 2.1). During the first four trial blocks for each dance, subjects observed the demonstration nine times (O), sequenced the prints four times (SP), and danced the sequence eight times (D). Two minutes were allowed for each pictorial-resequencing trial. The arrangement of the prints was recorded following each trial, and the prints were left in place for revisions/additions on the next trial. During the second and fourth trial blocks, free periods of 30 seconds were provided to be used as the subject desired (e.g., physical or mental practice or relaxation). The fifth trial block for each dance included a final two minutes for sequencing the prints followed immediately by two physical performances, i.e. dancing, with no additional demonstrations.

Order of presentation of the two sequences was counterbalanced in each group of subjects. As far as possible, the genders were equally distributed between the group that saw the folk dance first and the group that saw the jazz dance first.

TABLE 2.1

Sequential Order of Subject's Activities Within Each Trial Block: Observing Demonstration (O), Sequencing Prints (SP), Dancing (D), and 30-second Free Time (*).

Trial Block	Subject's Activities 1	2	3	4	5	6	7
1	O	O	SP	D	O		D
2		O	SP	D	O	*	D
3		O	SP	D	O		D
4		O	SP	D	O	*	D
5			SP	D			D

Note. Response acquisition was evaluated by analyzing the sequential arrangement of the still prints (SP). Performance reproduction was evaluated by analyzing videotaped recordings of the dancing (D).

Measurement and Scoring of Response Acquisition

Still photos for each sequence were produced directly from the videotape of the demonstration with a Mitsubishi Video-Copy-Processor Model P60W, using the freeze-frame and frame-advance features of a Panasonic VCR (NV-8950). A consistent temporal arrangement for each sequence was established by selecting the first and every fifth subsequent frame from the videotape, resulting in 52 and 60 photos for the folk and jazz dances, respectively. Pilot studies indicated that this number of separate pictures contained too much information for subjects to process in a reasonable time period. However, removing any of the photos resulted in the loss of information that was needed to illustrate the dances effectively. Consequently, consecutive photos were joined in pairs, resulting in 26 and 30 pairs of photos (folk and jazz, respectively) to be sequenced. This arrangement proved to be manageable for the subjects while maintaining the necessary visual information of each sequence. The photo-pairs (hereafter referred to simply as prints) were mounted on Bristol board (8.5cm by 22cm).

The accuracy of the print-resequencing task, reflecting the accuracy of the cognitive representation (Carroll & Bandura, 1982), was defined by the positioning and sequencing of the prints. One point was granted for each print positioned on the answer card in the quadrant representing the four-bar musical phrase in which the action occurred. A second point was awarded for each print that correctly followed the one immediately preceding it, regardless of the position of the two in the total sequence. The positioning and sequencing scores were summed to define the cognitive representation (CR) score. Because the folk and jazz dances produced slightly different numbers of prints, the maximum CR scores for the dances were 51 and 59, respectively.

Measurement and Scoring of Performance Reproduction

Subjects' physical performances were recorded using a General Electric, HQ Movie Video System VHS, CG 9810. Music for each dance performance was provided by audiotape played on a standard cassette player. Two aspects of dance performance were considered important: (a) the accuracy of the movement pattern, including the component actions and their sequential arrangement, and (b) the aesthetic quality of the presentation.

Scoring of performance accuracy. Before the videotaped performances were assessed, each component action (e.g., step, kick, turn) was described in terms of the dancer's (a) working foot, (b) non-working foot, (c) spatial orientation, (d) movement direction, (e) right arm position, (f) left arm position, (g) head position, and (h) torso shape. The researcher then scored each dance performance for performance accuracy (PA), based on the inclusion, sequencing, musical accuracy, and precision of each action. One point was awarded for the inclusion of each appropriate action. A sequencing point was given for each action that correctly followed the one immediately preceding it, regardless of their position in the total sequence. If an action was performed within its appropriate four-bar musical phrase, it received a point; if it was on the correct beat of that phrase, it received a second point. Finally, a precision score was determined, alloting one point for each of the eight descriptors of the action. Total possible points for a single action were 12. The PA score for a sequence was the sum of these points: 743 and 767 for the folk and jazz dances, respectively. Performance accuracy scoresheets appear in Appendix C.

Scoring of performance quality. For each sequence, every subject's most accurate performance (i.e., highest PA score) of the final trial block was edited, in random order, onto a single videotape for assessment of performance quality (PQ). Three experienced dance teachers independently rated these performances on a 1-to-10 point scale, considering aesthetic elements that contribute to high quality dance performance: technical skills related to individual movements, use of space, transitions, flow of movement, dynamics, musicality, and style. The PQ score for each sequence was the sum of the three raters' assessments (maximum = 30). Rating guidelines appear in Appendix D.

Results

Scores analyzed were from the fifth, no demonstration, trial block for each sequence: the final cognitive representation score, the mean of the performance accuracy scores for the two physical performances, and the performance quality score (the sum of the three raters' scores). Prior to other analyses, one-way multivariate analyses of variance (MANOVAs) were used to investigate possible gender effects on the set of dependent variables (CR, PA, and PQ scores) for each dance. Because the gender main effect did not reach significance on the response measures for the jazz dance, Wilks Lambda = .819, multivariate $F(3,36) = 2.65$, $p > .05$, data for males and females were pooled. For the folk dance, gender differences were found: Wilks Lambda = .719, multivariate $F(3,36) = 4.69$, $p < .01$. Hence, gender was included as an independent variable in subsequent analyzes of folk dance scores. Cronbach's alpha was used to estimate (a) split-half reliability of the CR and PA scores for each sequence and (b) interrater reliability for the PQ scores (Allen & Yen, 1979). Within-cell correlation coefficients were used to examine the relationship between response acquisition and performance reproduction, as measured in this study.

The Resequencing Task as a Measure of Response Acquisition

For the folk dance, internal consistency (α) of the CR measure was assessed by comparing the sum of the CR scores of musical phrases one and three to that of phrases two and four. The first four-bar musical phrase was the least complex from a foot-pattern perspective, and the third was the most complex of the sequence. This combination of phrases (1+3 vs 2+4) was also balanced with regard to position within the sequence, counteracting potential serial learning effects. For the jazz dance, the sum of the CR scores of musical phrases 1 and 4 was compared to that of 2 and 3. The first half of the jazz dance was identical to the second half but laterally reversed. Hence, the phrases selected for the split-half analysis of the jazz dance contained identical elements and did not favor performance on one side of the body.

Internal consistency of the CR measure was acceptable (a) for the total sample for both sequences, α = .79 and .80, folk and jazz, respectively, (b) for the novices for the folk dance, α = .84, and (c) for the experts for the jazz dance, α = .83. Cronbach's alpha was only moderately high for the novices on the jazz dance, α = .54, perhaps reflecting the clustering of scores in the bottom third of the potential range (Baumgarter, 1989). The small size and homogeneity of the expert group probably account for the low coefficient alpha, α = -.20, for their folk dance scores. Inexperience of all the subjects with the resequencing task may also have resulted in lowered reliabililty coefficients (Baumgarter, 1989). Coefficient alpha for split-half reliability and descriptive statistics for each sequence appear in Table 2.2.

TABLE 2.2

Means and Split-Half Reliability Estimates for Cognitive Representation Scores of Novice and Expert Dancers on Folk and Jazz Dances

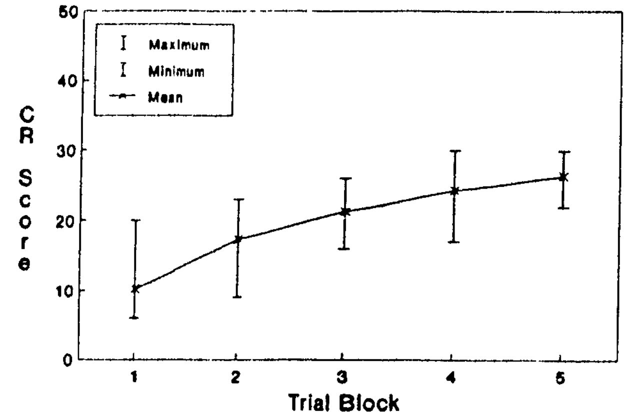
	FOLK				JAZZ			
GROUP(*N*)	*M*	*SD*	SE_M	α	*M*	*SD*	SE_M	α
Novice(30)	21.3	6.97	1.27	.84	15.0	5.00	0.94	.54
M(15)	20.6	6.75	1.74	.80	16.1	4.61	1.19	.30
F(15)	21.9	7.40	1.91	.89	14.3	5.42	1.40	.70
Expert(10)	26.4	3.47	1.09	-.20	25.9	9.60	3.04	.83
M(1)	24.0	0.00	--	--	38.0	0.00	--	--
F(9)	26.3	3.46	1.15	.02	24.6	9.13	3.04	.86
Total(40)	22.5	6.59	1.04	.79	17.8	7.91	1.25	.80
M(16)	20.8	6.57	1.64	.78	17.4	6.89	1.72	.65
F(24)	23.5	6.51	1.33	.81	18.2	8.51	1.74	.87

Note. Maximum possible CR scores: Folk = 51, Jazz = 59.

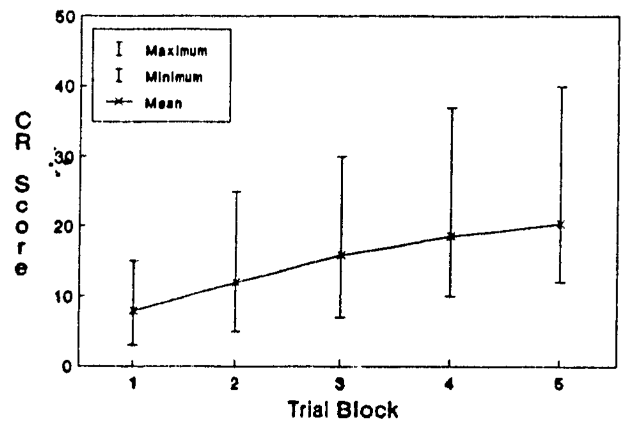
For both sequences, mean CR scores were higher for the experts (folk dance M = 26.4 and jazz dance M = 25.9) than the novices (folk dance M = 21.3 and jazz dance M = 15.0). The three novices with the most dance experience had CR scores above the means of their group: folk = 24, 27, and 40; jazz = 21, 21, and 20. One expert who scored below her group's mean for the jazz dance, CR score = 12, commented that the style was completely different from any jazz she had performed previously. This variance in jazz style is well documented (e.g., Cohen, 1986), and inexperience with the demonstrated style might be expected to result in a decreased ability to acquire the appropriate responses. The range of CR scores for the experience levels in the study--inexperienced novices, more experienced novices, and experts--was as expected.

Mean CR scores were higher for the folk dance than for the jazz dance for both groups (experts M = 26.4 and 25.9, folk and jazz, respectively; novices' M = 21.3 and 15.0, folk and jazz). The folk dance was less complex than the jazz dance with respect to (a) structure, having grouped repetitions of movements that the jazz did not, and (b) component actions, which in the folk dance were similar to one another and had few changes in the precision features. Because task complexity has been shown to affect observational learning (e.g., Gould, 1978), higher CR scores for the folk dance were expected.

The development of the cognitive representation is thought to occur with repeated demonstrations (Carroll & Bandura, 1987). In this study, mean CR scores for the novices increased consistently over the learning trials (folk dance = 8, 12, 16, 19, 20; jazz dance = 4, 8, 11, 13, 15). Mean CR scores also improved over trials for the experts (folk dance = 10, 17, 21, 24, 26; jazz dance = 8, 10, 15, 20, 26). This consistent improvement in the CR scores over trials supports the assumption that the resequencing task was measuring the development of the cognitive representation. Even on the final, retention trial, CR scores for 32 of the 40 subjects showed no decline on either of the dance sequences. For the eight subjects who did score lower for one of the sequences during the retention trial, the greatest decline in the CR score was only 5% (about 3 points of a potential 51 or 59). Assuming the CR scores reflect the accuracy of the internal representation (Carroll & Bandura, 1982), their tendency to increase over the acquisition period and remain stable when demonstrations ceased supports the assumption that learning was being measured by the print-resequencing task. Figures 2.1 and 2.2 illustrate mean performance curves for the print-resequencing task measuring response acquisition (CR scores) for the folk and jazz dances.

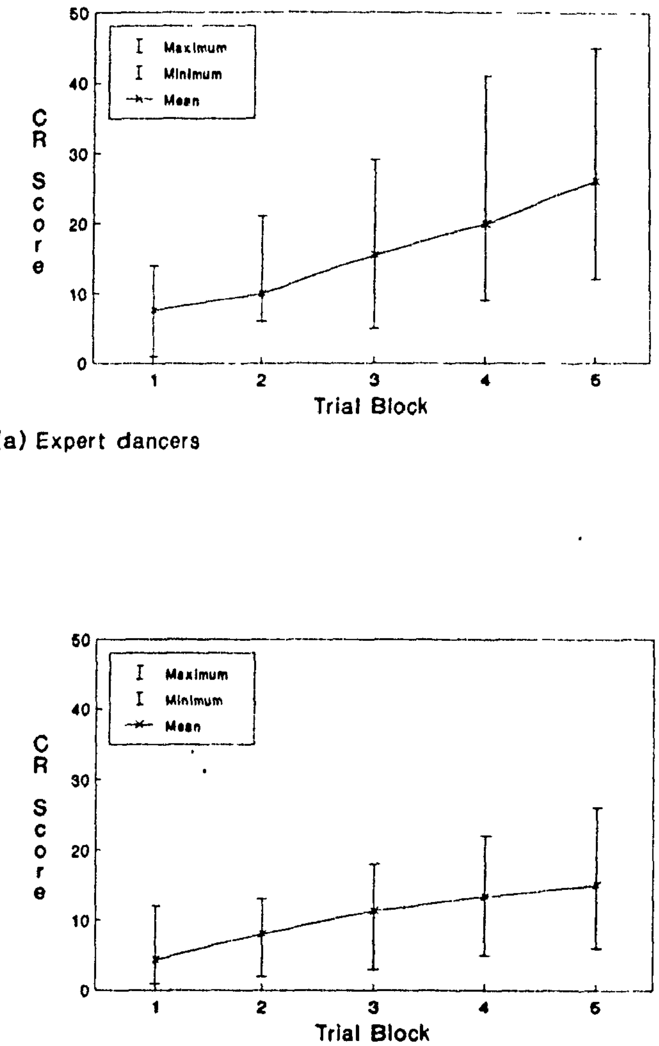


(a) Expert dancers



(b) Novice dancers

<u>Figure 2.1</u> Mean performance curves and range of responses for CR scores over five trial blocks for experts and novices on the folk dance.



(a) Expert dancers

(b) Novice dancers

<u>Figure 2.2</u> Mean performance curves and range of responses for CR scores over five trial blocks for experts and novices on the jazz dance.

Appropriateness of the Performance Reproduction Measures

Performance accuracy. Accuracy scores on the two physical performances of the final trial block were used as parallel halves for the analysis of internal consistency for the PA measure. Cronbach's alpha was relatively high in all cases: for novices, experts, and the total sample, in order, folk dance α = .95, .98, and .98, and jazz dance α = .97, .79, and .97. Mean PA scores were higher for the expert group (*M*s = 636 and 616, folk and jazz respectively) than the novice group (*M*s = 445 and 317 for folk and jazz). The three most experienced novice subjects scored considerably higher than their group's mean for both dances (folk: 619, 580, and 523; jazz: 615, 487, and 498). The PA measure appears to have been an appropriate assessment of the subjects' ability to replicate the sequences physically, with experts scoring higher than experienced novices who scored higher than inexperienced novices. Table 2.3 provides descriptive statistics and reliability coefficients for performance accuracy scores for the two sequences.

TABLE 2.3

Means and Reliability Estimates of Performance Accuracy Scores of Novice and Expert Dancers for Folk and Jazz Dances

	FOLK				JAZZ			
GROUP(N)	M	SD	SE_M	α	M	SD	SE_M	α
Novice(30)	445	90	16.4	.95	317	120	21.9	.97
M(15)	409	93	24.0	.98	302	99	25.4	.97
F(15)	482	74	19.1	.87	331	142	36.5	.97
Expert(10)	636	71	22.5	.98	616	108	34.2	.79
M(1)	586	00	--	--	567	00	--	--
F(9)	641	72	24.1	.98	622	114	38.0	.79
Total(40)	493	119	18.8	.98	392	175	27.7	.97
M(16)	420	100	25.0	.98	319	116	29.0	.98
F(24)	542	107	21.8	.96	440	193	39.5	.96

Note. Maximum possible PA scores: Folk = 743, Jazz = 767.

Performance quality. Cronbach's α for interrater objectivity was relatively high (a) for the total group, α = .96 for both dances, and (b) for the novices, α = .88 for both dances. Interrater objectivity for the quality assessment of experts' performances of the folk dance was only .72 but was .87 for the jazz dance. As shown in Table 2.4, mean performance quality scores were higher for the experts than the novices (folk dance Ms = 24 and 7, and jazz dance Ms = 23 and 7, experts and novices, respectively). Experienced novices generally scored higher than their group's mean (folk: 22, 12, 17; jazz: 20, 13, 7). These scores again appear to have been an appropriate assessment of the desired aspect of performance reproduction because experts were rated higher than experienced novices who were rated higher than less experienced novices.

TABLE 2.4

Means and Interrater Objectivity of Performance Quality Scores of Novice and Expert Dancers for Folk and Jazz Dances

	FOLK				JAZZ			
GROUP(N)	M	SD	SE_M	α	M	SD	SE_M	α
Novice(30)	7.1	4.2	0.77	.88	7.2	3.9	0.71	.88
M(15)	5.7	2.2	0.57	.76	6.9	3.0	0.77	.87
F(15)	8.5	5.3	1.37	.88	7.5	4.7	1.21	.90
Expert(10)	23.6	2.9	0.92	.72	22.5	3.9	1.23	.87
M(1)	19.0	0.0	--	--	19.0	0.0	--	--
F(9)	24.1	2.6	0.86	.60	22.9	3.9	1.30	.86
Total(40)	11.3	8.2	1.30	.96	11.0	7.7	1.22	.96
M(16)	6.6	3.9	0.98	.93	7.7	4.2	1.05	.92
F(24)	14.4	8.9	1.82	.96	13.3	8.8	1.80	.97

Note. Maximum possible PQ scores for each dance = 30.

Relationship Between Response Acquisition and Performance Reproduction

It was hypothesized that response acquisition, as measured by the cognitive representation scores, would be moderately positively correlated with performance reproduction, measured by dance performance accuracy and quality. When experts and novices were considered together, CR scores were positively correlated with PA scores for both the folk dance: $r = .52$, $p < .001$, and the jazz dance: $r = .35$, $p < .05$. Cognitive representation scores were also positively correlated with PQ scores for the folk dance, $r = .34$, $p < .05$, but not for the jazz dance ($p > .05$). Performance accuracy and quality scores were positively correlated for both dances, folk dance: $r = .43$, $p < .01$, and jazz dance: $r = .64$, $p < .001$. These results are shown in Table 2.5.

TABLE 2.5

Correlations Between Response Acquisition Scores (CR) and Performance Reproduction Scores (PA, PQ) for All Subjects on the Folk Dance[a] and the Jazz Dance[b]

	Cognitive Representation	Performance Accuracy	Performance Quality
Cognitive Representation	--	.52***	.34*
Performance Accuracy	.35*	--	.43**
Performance Quality	.17	.64***	--

Note. [a]above the diagonal. [b]below the diagonal.

N = 40. (Experts: n = 10; novices: n = 30).

* $p < .05$. ** $p < .01$. *** $p < .001$.
(Two-tailed test)

For the expert dancers, CR scores only correlated significantly with PQ scores for the jazz dance, $r = .65$, $p < .05$. The correlation between CR and PQ scores for the folk dance approached significance, $r = .58$, $p < .10$. Other nonsignificant relationships probably reflect the homogeneous nature of this small group ($n = 10$).

For the novices, CR scores were significantly correlated with PA scores for both dances, folk dance: $r = .52$, $p < .01$, and jazz dance: $r = 48$, $p < .01$. Dance performance accuracy and quality were also significantly related for the folk dance, $r = 53$, $p < .01$, and for the jazz dance, $r = .63$, $p < .001$. These results, reported in Table 2.6, lend support to the hypothesis of the study.

TABLE 2.6

Correlations Between Response Acquisition Scores (CR) and Performance Reproduction Scores (PA, PQ) of Novices for Folk Dance[a] and Jazz Dance[b]

	Cognitive Representation	Performance Accuracy	Performance Quality
Cognitive Representation	--	.52*	.35[c]
Performance Accuracy	.48*	--	.53*
Performance Quality	.32	.63**	--

Note. [a]above the diagonal. [b]below the diagonal.

$n = 30$.

* $p < .01$. ** $p < .001$. (Two-tailed test).

[c]$p < .10$.

Discussion

Measurement of the Two Phases of Observational Learning

The initial goal of this study was to measure response acquisition (learning) separately from performance reproduction (performance) for a movement sequence similar to that of a real-life modeling experience. The print-resequencing task appears to have been relatively successful at assessing response acquisition without inference from an overt performance. However, time contraints of the protocol, the novelty of the print-resequencing task, and the continually improving CR scores displayed by most subjects suggest that, given more time, subjects might have accurately sequenced more prints. That is, for some subjects, the resequencing task may not have revealed accurately the total learning that had occurred. Future research might allow as much time as desired for sequencing the photos, using accuracy of recall and total sequencing time as dependent variables. Experienced subjects would be expected to produce the sequences more completely and accurately in less time than novices.

High scores on the resequencing task suggest a well-developed cognitive representation of the sequence (Carroll & Bandura, 1982). The task seems to assess this representation from two perspectives. Resequencing scores (CR scores) appear to measure (a) the information perceived and remembered from the demonstration and (b) the information that the subject is able to extract from the still prints. Based on their comments during the resequencing task, it seemed that many novices had difficulty recognizing differences between the still photos of the actions. Subjects more adept at interpreting the prints observed even subtle variations that provided cues such as body weight distribution and movement direction, reflecting a well-developed understanding of the movement. In earlier research (Carroll & Bandura, 1987, 1990), the accurate selection of photos of component actions from similar, distractor photos was said to reflect the accuracy of the cognitive representation. This ability to differentiate between still prints of the movements seems to reveal the clarity of the cognitive representation and an expanded knowledge base that enables the subject to perceive and recognize specific details of the observed movement. The abilities to (a) perceive and recall demonstrated information and (b) interpret still photos of actions within the demonstrated sequence are probably both on continua over the range of skills of the subjects studied.

Evaluation of performance reproduction considered both accuracy and quality of the performance, and the measurement tools employed seem to have been appropriate. Performance quality, as measured in this study, appears to be an aspect of performance reproduction related to content and sequencing accuracy. Comments of the expert raters supported this correlational finding: Many learners who were apparently unable to replicate the sequence of movements were also unable to "dance" the sequence. As subjects reproduced more elements of a sequence with confidence and cohesion, the raters judged their performances to be more expressive and stylistic.

Relationship Between the Two Phases of Observational Learning

The second concern of the study addressed the relationship between response acquisition and performance reproduction. It was hypothesized that the two phases of observational learning, as assessed in this study, would be moderately positively correlated. The correlations between the cognitive representation scores and dance performance accuracy scores generally support this hypothesis and correspond favorably with those reported by Carroll and Bandura (1985, 1987, 1990). The cognitive representation, as measured by the resequencing task, apparently relates to accuracy in physical performance.

Although dance performance accuracy by the novices was significantly related both to the cognitive representation and to performance quality, the cognitive representation was not correlated with quality of the dance performance. Apparently, the variance that the print-sequencing task and dance performance accuracy shared was different from that shared by dance accuracy and dance quality. At this level of expertise, the "aesthetic quality" assessed in the study may have been due, at least in part and for some individuals, to the subject's general movement style and quality, rather than to knowledge of the sequence of actions and the stylistic characteristics of the demonstrated dance. This inherent movement quality was, in fact, commented on by all three teachers who evaluated performance quality. Some novices simply "moved well" or "had a dance presence". This inherent movement quality may have enabled these novices to link movements more easily in the physical replication of a structured sequence. These novices may also have incorporated limb and body placements naturally in their dances, even though they were not totally aware of what they should be doing to replicate the demonstrated sequence.

The observed moderate relationships between response acquisition and performance reproduction scores seem to support Bandura's (1986) belief that the cognitive representation acquired solely from observation is incomplete and by itself does not account for skillful overt performance. The resequencing task may assess cognitive learning, but it obviously does not encompass the performance skills required for physical replication of the actions. For complex tasks, previously acquired skill and/or physical practice are required to establish the motor production patterns needed to replicate the demonstrated behavior in a coordinated, controlled manner. Although cognitive factors appear to be important in determining motor behavior, providing knowledge of movement patterns of relatively long sequences, there is obviously much more involved in motor learning. The ability to link the cognitive representation with the motor system to create appropriate action, incorporating dimensions of movement such as force, tension, and timing to produce skilled, aesthetic performance, requires additional skills of the learner.

Considering response variables as percentages. The relationship between response acquisition and performance reproduction is considered from another perspective in Figure 2.3, which illustrates, for both levels of expertise on each dance, mean percentage accuracy of the maximum possible CR and PA scores. Interpretation of this comparison must be made with caution, as the two percentages may not be comparable. However, the comparison seems acceptable because the scoring schemes for CR and PA were developed to measure, as closely as possible, similar components of the print-resequencing and dancing tasks. Positioning of the prints on the scorecard paralleled inclusion and musical placement of the danced actions. Sequencing of the component actions was scored the same in both schemes. Precision scores in the dance performance (PA) reflected knowledge of the details of specific movements in the demonstration. This knowledge was also critical for distinguishing between the many prints in the resequencing task.

For both dances and both levels of expertise, percentage performance accuracy scores were higher--by 15 to 26%--than obviously much more involved in motor learning. The ability to link the cognitive representation with the motor system to create appropriate action, incorporating dimensions of movement such as force, tension, and timing to produce skilled, aesthetic performance, requires additional skills of the learner.

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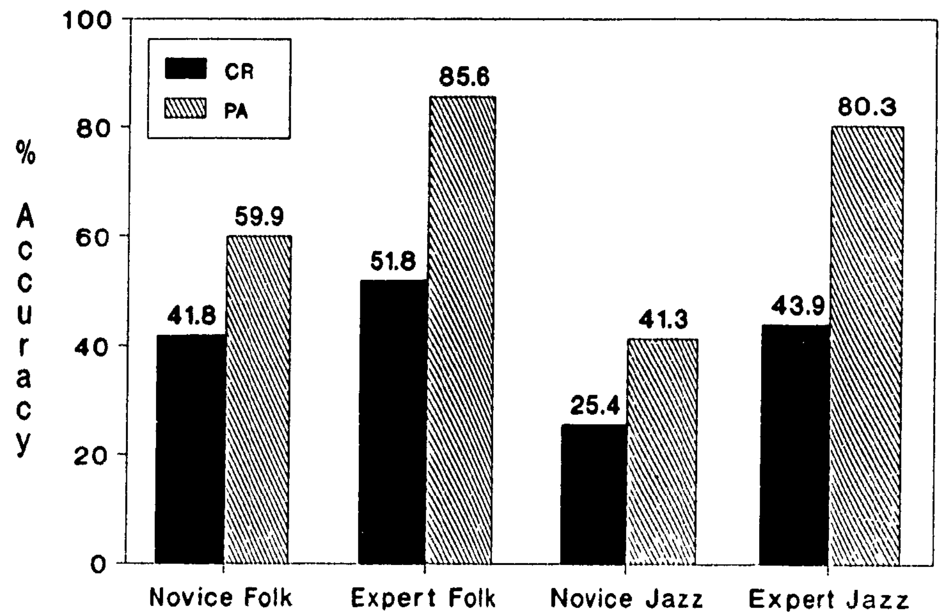
For both dances and both levels of expertise, percentage performance accuracy scores were higher--by 15 to 26%--than percentage cognitive representation scores. Apparently, most subjects were able to reproduce a higher percentage of the dance content physically than they were able to represent in the print-resequencing task.

This finding may have resulted from the limitations of the resequencing task discussed previously. It may also reflect differences in motivation levels of the subjects for the tasks of arranging the prints and dancing the sequences. However, the results also seem to suggest that observers may be able co replicate actions of which they are not aware, apparently having "learned" them in a motor sequencing, if not a conscious cognitive, sense. Experts frequently seem to be able to perform skills accurately without being able to verbalize how they do so (Adelson, 1984). Their procedural knowledge has apparently been developed in some way that "hides the details of the processes" (Adelson, 1984, p. 495). In this study, even the novices seemed to have acquired information from the demonstration that they could replicate physically but were not able to illustrate through the pictorial-resequencing task. For example, subject 8 had 20% accuracy on folk dance print-resequencing and 54% accuracy for dance performance; similarly, subject 18 had 31% and 65% accuracy for print-resequencing and dancing, respectively. For the jazz dance, subjects 2 and 11 had percentage accuracy scores of 15% and 17%, print-resequencing, and 39% and 50%, dancing.



<u>Figure 2.3</u> Response acquisition (CR) and performance accuracy (PA) scores expressed as percentages of total possible scores for experts and novices on both dances.

Dynamic view of modeling. Scully and Newell (1985) have proposed an alternative view of modeling that may help explain this phenomenon. The "dynamic view" hypothesizes that there is no need for an intermediate cognitive representation or symbolic coding step between the observation and performance of a modeled action. The visual system automatically processes the information in such a way that the motor system acts directly on what has been detected visually. Physical reproduction would depend entirely on detection of relevant information in the demonstration and adequate motor resources to replicate the actions. This view suggests that the observer would not necessarily have a symbolic representation to retrieve from memory to use as a comparison for selecting and arranging the photos during the resequencing task. If this were the case, the observer would have to create a mental representation of some description from the overt performance before being able to perform the print-resequencing task accurately.

Kinesthetic mode of symbolic representation. Another possible explanation for performance scores being higher, on a percentage accuracy basis, than cognitive representation scores may be the existence of a "kinesthetic" mode of symbolic representation, in addition to the visual and verbal forms that are generally believed to exist (Paivio, 1986). Such a cognitive representation might manifest itself in direct physical performance but might not be easily translated into the verbal or visual modalities assessed through descriptive or photo-recognition and sequencing tasks. The dynamic view of observational learning as well as the potential of a kinesthetic form of cognitive representation deserve further investigation.

Conclusions

Results of this study suggest that independent measures and analyses of the two phases of Bandura's social cognitive theory (1986) are possible for at least some complex, ecologically valid motor tasks. Evaluations of response acquisition via pictorial-resequencing and of performance reproduction via precise analyses of physical replications of the demonstrated dance sequences appear to be appropriate reflections of varied observer responses.

The study also lends support to Bandura's (1986) proposal that response acquisition and performance reproduction are separate, but interrelated, components of the total observational learning process. The cognitive representation is demonstrated to be positively related at a moderate level to accuracy in the overt performance, as Bandura contends. However, questions remain concerning the unexplained variances between response acquisition scores and performance reproduction scores, as measured in this study. Obviously, the physical skills necessary for translation of the cognitive representation into overt performance provide some of the answers. It has also been suggested that a kinesthetic form of symbolic representation may exist, supplementing the verbal and imaginal coding modalities generally believed to be critical to successful observational learning. Further consideration of this possiblity seems warranted.

The ability to examine response acquisition and performance reproduction independently and with accuracy should enable researchers to pursue additional questions concerning the effective use of demonstrations and, perhaps, the role of cognition in motor skill acquisition.

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The investigation in Chapter 2 resulted in (a) an adaptation of the pictorial-resequencing task for use in assessing response acquisition with relatively lengthy movement sequences and (b) the development of assessment criteria for evaluating performance reproduction of those same sequences. The measurement instruments were applied to the observational learning of two dance sequences and were shown to be effective for use with university-aged subjects of two levels of dance expertise. In Chapter 3 these measurement tools are employed in a study of expert-novice effects on the two phases of observational learning in dance.

CHAPTER 3

EXPERT-NOVICE EFFECTS ON THE TWO PHASES OF OBSERVATIONAL LEARNING IN DANCE

ABSTRACT

The effects of domain-specific expertise on the learning and performance phases of modeling (Bandura, 1986) in dance were investigated. Over separate acquisition periods for two dances, university undergraduates (10 experts, 29 novices) had several opportunities to observe the dances, to sequence still photos to represent each dance, and to physically perform the observed patterns. Expert-novice differences were found to affect both phases of the process. Experts generally recalled more information than novices, representing it more accurately in the pictorial-resequencing task and in overt performances. Qualitative data suggested that experts used more learning strategies and were not affected by irrelevant information. They were better at all aspects of the physical performance, including musicality and performance quality. The findings indicate the importance of defining subject expertise in future modeling studies and the need for dance educators to address the total modeling process in relation to the dance expertise of their students.

EXPERT-NOVICE EFFECTS ON THE TWO PHASES OF OBSERVATIONAL LEARNING IN DANCE

Social cognitive theory (Bandura, 1986) emphasizes the active involvement of the learner in the observational learning or modeling process. The theory proposes that modeling effects occur as a result of four interrelated subprocesses: attention, retention, motor reproduction, and motivation. The observer's abilities to attend to relevant information in the demonstration, apply strategies to enhance recall of that information, and physically replicate the component movements of the demonstrated activity combine with the motivation to do so. At any subprocess, observer characteristics may affect the success of the observational learning experience.

Learning, in information processing terms, is the cognitive acquisition of "how to do something" (Bandura, 1986, p. 107). From this perspective, learning corresponds to response acquisition (attention and retention). The overt performance, product of performance reproduction (motor reproduction and motivation), reflects both cognitive and physical aspects of the process. Understanding potential effects of observer characteristics on each of these phases seems critical to an effective use of demonstrations in motor skill instructional situations.

Prior experience is one source of observer variation that may affect motor skill modeling. In general, experience may contribute to an expanded knowledge base (general or domain specific), improved use of cognitive control processes, a larger repertoire of movement skills, and positive motivation to imitate the action accurately (Bandura, 1986; French & Thomas, 1987; Gallagher, 1984; Wall, 1986).

Studies investigating the effect of prior experience and its related knowledge base on skill in sports have shown that experts in a particular sport are superior to novices in recall of structured game situations, in the use of advance visual cues, and in the ability to formulate strategic decisions within the game situation (Starkes & Deakin, 1984). These conclusions are based primarily on studies of team and racquet sports. Only a few of the expert-novice studies in motor behavior have considered skills such as gymnastics, dance, and figure skating. In these motor skills, the athlete's focus is primarily on the production of a consistent, accurate physical performance that matches a conceptual ideal rather than on the stategy use and problem solving that are characteristic of many other types of sports (Deakin & Allard, 1991). In addition, in activities such as gymnastics, dance, and figure skating, the athlete is often required to recall relatively lengthy, sequential movement information in the form of performance routines or programs.

The specific movement pattern that the gymnast, dancer, or figure skater is required to produce is frequently learned through modeling. Therefore, the skills required of these athletes in typical instructional situations involve accurate perception of relevant information in the demonstration, the ability to encode sometimes large quantities of information to facilitate its recall, and the physical skills needed to replicate the observed movement. In addition, translation of the covert representation of the behavior into overt performance must be followed by an appropriate interpretation of various types of performance feedback, so that comparisons of the performance and the internal conception can be made and corrections implemented.

Four studies illustrate the effects of expertise on this type of motor skill. The researchers considered ballet dance (Starkes, Deakin, Lindley, & Crisp, 1987), creative modern dance (Starkes, Caicco, Boutilier, & Sevsek, 1990), gymnastics (Stafford, 1988), and figure skating (Deakin & Allard, 1991). Results indicated that (a) in all cases, domain-specific information was recalled more accurately by experts in the domain than by those less skilled, (b) experts recalled structured sequences with greater precision than nonstructured sequences in ballet and figure skating but not in creative modern dance, and (c) coding strategies appeared to vary with expertise and with the demands of the particular recall task. These four studies support the belief that skilled gymnasts, dancers, and figure skaters behave differently than those who are less skilled, when the situation requires domain-specific experience and knowledge.

They also seem to suggest that observational learning of these skills may be affected by expertise. None of the four was described as an observational learning study. However, one of the experiments by Deakin and Allard (1991, Experiment 1) and all of the other studies involved observation of a demonstration followed by some form of recall of the behavior. Stafford (1988) assessed response acquisition via a pictorial-resequencing task, but performance reproduction was not measured. Starkes et al. (1990) considered overt performance only. Although Deakin and Allard (1991) and Starkes et al. (1987) considered both verbal and motor recall of the demonstrated skills, the two recall modes were blocked over trials. No individual subject reproduced any sequence both verbally and motorically. Consequently, in these studies, learning (response acquisition) and performance (performance reproduction) were not both assessed for any subject, and comparisons between the two phases could not be made. Furthermore, in all cases, subjects were exposed to the demonstration only twice, and each sequence of movements contained only eight elements. Hence, these studies did not reflect realistic instructional situations in which longer sequences of material may be observed several times with physical practice sessions interspersed among the demonstrations.

Purpose of the Study

The current study investigated expert-novice effects on the two phases of observational learning (Bandura, 1986), using an ecologically valid motor task in which movement precision and memory of sequential behavior were important. Assessment tools developed in a previous report (Chapter 2) were used to measure response acquisition and performance reproduction independently. Over a series of acquisition trial blocks, subjects were required to observe two dance patterns, sequence still photos to represent each dance, and dance the observed patterns. Within the limits of the experimental protocol, the procedures were designed to reflect a relatively realistic learning experience.

Three hypotheses were proposed. First, expert dancers would acquire more accurate information from the demonstration than would novice dancers. Second, the ability to reproduce a demonstrated sequence physically would be greater for expert dancers than for novice dancers. Finally, it was expected that within the novice group, subjects with more experience and basic skill in dance would learn and perform the dances better than those with less experience and skill.

Method

Subjects

The ten experts (1 male, 9 females; M age = 22.8 years) were volunteers enrolled in dance degree programs (Bachelor of Fine Arts or Bachelor of Arts) at a university in Toronto, Ontario. They had been selected by audition to be members of the university's performing dance ensemble, indicating superior performance abilities amongst third- and fourth-year students. Their dance experience (M = 11.1 years) included at least three years of intense daily training in classical ballet and modern dance. They were tested on two days in March 1990.

Thirty physical education majors (15 males, 15 females; M age = 22.4 years) at an English university in Montreal, Québec, were classified as novices for the study. Twenty-one of the novices had as their only dance experience one 26-hour physical education rhythmics course plus small amounts of free-time social dance participation. Six others had taken up to two years of childhood ballet lessons and/or had participated in aerobic exercise classes. Only three of the novices had experienced dance instruction (ballet, tap, jazz, or folk dance) of longer duration (M = 7.2 years). The novices were tested over a 10-day period in January 1990.

The novices were enrolled in a credit folk dance course as part of their regular academic program. Approximately 90% of the students in this program select folk dance as one of their required "athletic skills" courses. Hence, the novice dancers were considered a representative sample of the pre-service, physical education population of the university. All were volunteers, having selected participation in the project as an option among possible assignments for the course.

Defining Expertise Within the Novice Group

Prior to testing, the novices completed a movement experience questionnaire (Appendix E) and were rated on their ability to perform basic locomotor movements frequently used in dance. The questionnaire was designed to assess previous experience in (a) dance, (b) "related" movement activities such as gymnastics and figure skating, which were operationally defined as being similar to dance (nonmanipulative skills that focus primarily on production of a specifically defined motor pattern), and (c) all "other" physical activities such as team sports. Scoring of the questionnaires was based on the number of activities in which the subject had participated and the amount of time spent in each activity after the age of five.

No valid and reliable screening device for grouping dancers according to their dance ability or skill level appears to be available (M. Hanson & S. Minton, personal communications, November 8, 1989). To address this need, subjective assessments of performance in an audition class are generally made. Therefore, during the first lesson of the folk dance course, before testing began, the novices were rated on their ability to perform basic locomotor movements and short sequences similar to those frequently used in elementary dance classes. These basic dance skill tasks (Appendix F) require rhythm, coordination, and concentration as well as knowledge of and ability to perform some specific movements (e.g., skip, leap). Five teachers experienced in dance instruction independently rated the subjects' live performances on each task on a scale of 0-to-5. The basic dance skill score was defined as the score for the 11 skills summed over the five raters (maximum = 275).

Dance experience scores, as determined by the experience questionnaire, and the basic dance skill scores were converted to standardized scores and summed. The resulting expertise scores were used to rank-order the 30 novices and group them by thirds into high, middle, and low groups on dance expertise.

Modeled Behavior

The modeled stimuli consisted of two 16-measure dance sequences, one of folk dance and one of jazz (Appendix B). These sequences were similar to those frequently used in dance classes for university-aged students and were designed to present a variety of step patterns, component movements, and sequence characteristics. Each sequence lasted about 30 seconds. They were modeled on videotape by an experienced female dancer whose spatial orientation was the same as that of the observer. Music accompanied both the demonstrations and the subjects' physical performances.

Procedures

Subjects were tested individually in their university dance studios with only the experimenter and videocamera operator present. They were informed of the purpose of the study, and all procedures were explained. During the four acquisition trial blocks for each dance, subjects observed the demonstration nine times, sequenced still photos of the actions in the dance four times, and physically performed the dance eight times (Table 2.1). The fifth block for each dance consisted of a print-sequencing attempt and two physical performances with no additional demonstrations. Two minutes were allowed for each print-sequencing trial with the prints left in place for the next trial. Two 30-second free periods were provided during the procedure for subjects to use as desired. The students were encouraged to use any stategies that might help them learn the dances, but no augmented information was provided during the testing. Order of presentation of the two sequences was counterbalanced within both the expert and novice groups. As far as possible, the genders were equally distributed between those who saw the folk dance first and those who saw the jazz dance first in each group.

Field notes were taken during the testing to facilitate interpretation of the subjects' sequencing scores and physical performances. Following the testing, subjects responded to a questionnaire related to strategy use (Appendix G).

Assessment of Response Acquisition or Learning

Measurement of response acquisition (learning) was based on the subject's ability to arrange a scrambled set of still photos to represent the sequential movement pattern of each dance. Photos of the component movements were produced from the videotaped demonstration with a Mitsubishi Video-Copy-Processor Model P60W, in conjunction with the freeze-frame and frame-advance features of a Panasonic VCR (NV-8950). Every fifth frame of each dance demonstration was selected to provide the visual information needed to represent the dance. Consecutive photos were then linked in pairs to create 26 and 30 photo-pairs or "prints" (folk and jazz, respectively) for sequencing.

Accuracy of the resequencing task, the CR score, was believed to reflect the accuracy of the cognitive representation formed as a result of response acquisition (Carroll & Bandura, 1982). The CR score was defined as the sum of (a) positioning the prints (each print positioned within its appropriate four-bar musical phrase) and (b) sequencing the prints (each print correctly following the immediately preceding print, regardless of their position in the total sequence). Maximum CR scores for response acquisition were 51 and 59 for the folk and jazz dances, respectively.

Assessment of Performance Reproduction or Performance

Physical performances of both dances were videotaped for analysis. Performance accuracy (PA) scores were based on (a) the inclusion of appropriate actions (one point per action), (b) the sequencing of the actions (one point for each action that correctly followed the action immediately preceding it, regardless of their position in the total sequence), (c) musicality (one point if the action was performed within the appropriate four-bar musical phrase and a second if it was on the correct beat of that phrase), and (d) precision (one point for each of eight descriptors related to arm positions, body shape, spatial orientation, etc.). Thus, twelve points were possible for each action, resulting in maximum scores of 743, folk dance, and 767, jazz dance. For each dance, the mean PA score of the final two performances of the fifth trial block was used for analyses.

Three judges independently assessed each subject's most accurate performance (highest PA score) of the final trial block for a performance quality (PQ) measure for each dance. Performances were rated for aesthetic characteristics on a 1-to-10 point scale. The three judges' performance quality scores were summed, resulting in a potential PQ score of 30 for each dance for each subject. These two scores, performance accuracy (PA) and performance quality (PQ), were considered complementary elements of performance reproduction.

Results

The primary hypotheses of this study were concerned with differences between experts and novices in their ability to acquire sequential dance information from a demonstration and to reproduce the demonstrated dance physically. Following preliminary data screening, expert-novice differences on response acquisition (CR scores) and performance reproduction (PA and PQ scores) were analyzed. In addition, differences between the two expertise groups on the four component subscores of performance accuracy were evaluated. Qualitative data were investigated to supplement the quantitative findings.

A second interest of the study involved potential differences among novice dancers with varied levels of prior dance experience and skill in basic dance movements. The effect of expertise, defined by dance experience and basic dance skill, on the response acquisition and performance reproduction variables was assessed.

Preliminary Analyses

Previous examinations of the CR, PA, and PQ measures (Chapter 2) found them to be acceptably reliable tools (folk dance: Cronbach's α for CR = .79, for PA = .98, for PQ = .96; jazz dance: Cronbach's α for CR = .80, for PA = .97, for PQ = .96). For the basic dance skills assessment, Cronbach's coefficient alpha for interrater reliability was found to be .93. To establish the reliability of the scoring method of the experience questionnaire, the investigator randomly selected ten completed questionnaires. Three widely experienced physical education specialists rank-ordered these questionnaires according to their assessment of each subject's motor skill experience. The three rankings were each correlated with that determined by the scores on the questionnaires. Spearman correlation coefficients were found to be $r = .71$ ($p < .02$), $r = .73$ ($p < .01$), and $r = .68$, ($p < .02$). Cronbach's α was .80 for interrater reliability of the three raters for the experience questionnaire rankings.

Screening of the data prior to analysis (see Tabachnick & Fidell, 1989) identified one novice as an outlier on the dance-experience variable (score = 11.21, group $M = 0.0$, $SD = 2.4$) and on the basic dance skill score (score = 243, group $M = 131$, $SD = 28.6$). Hence, data for this subject were eliminated from all subsequent analyses, reducing the novice group to 29. The expertise levels of the novice dancers were then: (a) low novice, $n = 10$, (b) middle novice, $n = 10$, and (c) high novice, $n = 9$.

Frequency histograms of each DV showed reasonably balanced distributions; so there was no need to examine dance: Cronbach's α for CR = .79, for PA = .98, for PQ = .96; jazz dance: Cronbach's α for CR = .80, for PA = .97, for PQ = .96). For the basic dance skills assessment, Cronbach's coefficient alpha for interrater reliability was found to be .93. To establish the reliability of the scoring method of the experience questionnaire, the investigator randomly selected ten completed questionnaires. Three widely experienced physical education specialists rank-ordered these questionnaires according to their assessment of each subject's motor skill experience. The three rankings were each correlated with that determined by the scores on the questionnaires. Spearman correlation coefficients were found to be $r = .71$ ($p < .02$), $r = .73$ ($p < .01$), and $r = .68$, ($p < .02$). Cronbach's α was .80 for interrater reliability of the three raters for the experience questionnaire rankings.

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Frequency histograms of each DV showed reasonably balanced distributions; so there was no need to examine scatterplots for each pair of DVs within each group. Skewness, ranging from -1.8 to 1.9, was not extreme for any of the variables. With approximately equal sample sizes, robustness of significance tests was expected. Box's M test for homogeneity of dispersion matrices produced $\underline{F}(18, 4238) = 1.59$, $\underline{p} > .05$ for the folk dance and $\underline{F}(18, 4238) = 1.40$, $\underline{p} > .05$ for the jazz dance, confirming homogeneity of variance-covariance matrices. The determinants of the pooled within-cells correlation matrices were found to be -.51 and -.50, folk and jazz dances, respectively. These are sufficiently different from zero that neither multicollinearity nor singularity were judged to be a problem.

Gender differences, as determined by one-way multivariate analyses of variance (MANOVAs), did not reach significance for the jazz dance for the set of dependent variables, multivariate $\underline{F}(3,35) = 2.36$, $\underline{p} > .05$. So the jazz dance data were pooled across gender for subsequent analyses. However, for the folk dance, significant differences were found between males and females: Wilks Lambda = .731, multivariate $\underline{F}(3,35) = 4.30$, $\underline{p} < .05$. Consequently, gender was included as an independent variable in following analyses of the folk dance data.

Descriptive Statistics

Descriptive statistics for response acquisition (CR scores) and performance reproduction (PA and PQ scores) for the novice and expert groups appear in Tables 3.1 for the folk dance and 3.2 for the jazz dance. For the folk dance, mean scores of the experts (CR = 26, PA = 636, PQ = 24) were consistently higher than those of the three levels of novices (CR = 22, 23, 18; PA = 487, 460, 376; PQ = 8, 6, 6). On the jazz dance, experts also scored higher on each dependent variable (experts CR = 26, PA = 616, PQ = 23; novices CR = 14, 14, 17; PA = 336, 276, 310; PQ = 7, 5, 9). Interestingly, the mean scores of the three novice subgroups did not always follow the decreasing pattern that was expected with decreased expertise. These results are also illustrated in Figures 3.1 and 3.2.

TABLE 3.1

Mean Response Acquisition (CR) and Performance Reproduction (PA, PQ) Scores for Folk Dance by Males and Females With Varied Dance Expertise

Variable	Level of Expertise(n)[a]	M	SD	SE_{MEAN}
CR Score	Novice 1(10)	18.3	5.2	1.6
	M(8)	18.5	4.3	1.5
	F(2)	17.5	10.6	7.5
	Novice 2(10)	23.2	7.0	2.2
	M(5)	25.4	8.6	3.8
	F(5)	21.0	5.0	2.2
	Novice 3 (9)	22.3	8.5	2.8
	M(2)	18.0	7.1	5.0
	F(7)	23.6	8.9	3.4
	Expert (10)	26.4	3.5	1.1
	M(1)	26.7	0.0	---
	F(9)	22.6	3.6	1.2
PA Score	Novice 1(10)	375.5	93.4	29.2
	M(8)	355.8	90.6	32.0
	F(2)	454.3	73.9	52.3
	Novice 2(10)	460.1	48.2	15.1
	M(5)	473.7	58.9	26.3
	F(5)	446.5	35.8	16.0
	Novice 3 (9)	487.0	71.4	23.8
	M(2)	459.8	15.9	11.2
	F(7)	494.8	80.2	30.3
	Expert (10)	635.7	70.5	22.0
	M(1)	585.5	0.0	---
	F(9)	641.3	72.4	24.1

(TABLE 3.1 con't. on next page)

(TABLE 3.1, con't.)

Variable	Level of Expertise(n)[a]	M	SD	SE_{MEAN}
PQ Score	Novice 1(10)	6.3	2.6	0.8
	M(8)	5.8	2.6	0.9
	F(2)	8.5	0.7	0.5
	Novice 2(10)	5.6	2.4	0.8
	M(5)	5.0	1.6	0.7
	F(5)	6.2	3.1	1.4
	Novice 3 (9)	8.1	4.3	1.4
	M(2)	7.5	0.7	0.5
	F(7)	8.3	5.0	1.9
	Expert (10)	23.6	2.9	0.9
	M(1)	19.0	0.0	---
	F(9)	24.1	2.6	0.9

Note. Maximum possible scores: CR = 51, PA = 743, PQ = 30.

[a] Novice subgroups: 1 = low, 2 = middle, 3 = high.

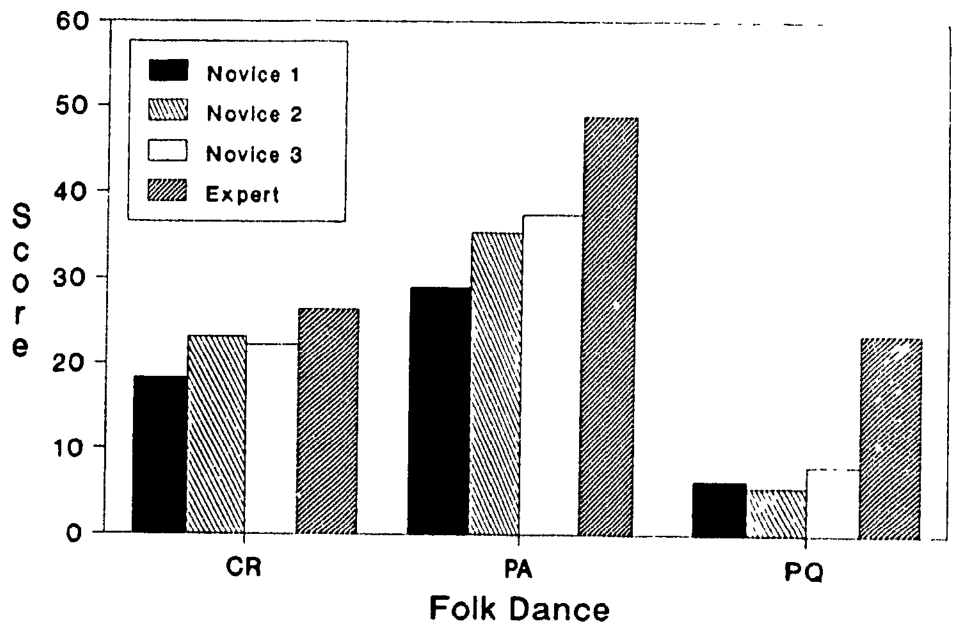

Figure 3.1. Mean scores for response acquisition (CR) and performance reproduction (PA, PQ) for folk dance by expert and novice dancers.

Novice expertise: 1 = low, 2 = middle, 3 = high.

Note. PA scores are proportionate: 1/13.

TABLE 3.2

Mean Response Acquisition (CR) and Performance Reproduction (PA, PQ) Scores for Jazz Dance by Subjects With Varied Dance Expertise

Variable	Level of Expertise(n)[a]	M	SD	SE_{MEAN}
CR Score	Novice 1(10)	16.5	4.8	1.5
	2(10)	14.0	5.0	1.6
	3 (9)	13.9	5.1	1.7
	Expert (10)	25.9	9.6	3.0
PA Score	Novice 1(10)	310.4	108.9	34.0
	2(10)	276.3	117.6	36.8
	3 (9)	336.3	99.3	33.1
	Expert (10)	616.3	108.8	34.0
PQ Score	Novice 1(10)	8.6	3.4	1.1
	2(10)	5.0	1.5	0.5
	3 (9)	6.7	3.1	1.0
	Expert (10)	22.5	3.9	1.2

Note. Maximum possible scores: CR = 59, PA = 767, PQ = 30.

[a] Novice subgroups: 1 = low, 2 = middle, 3 = high.

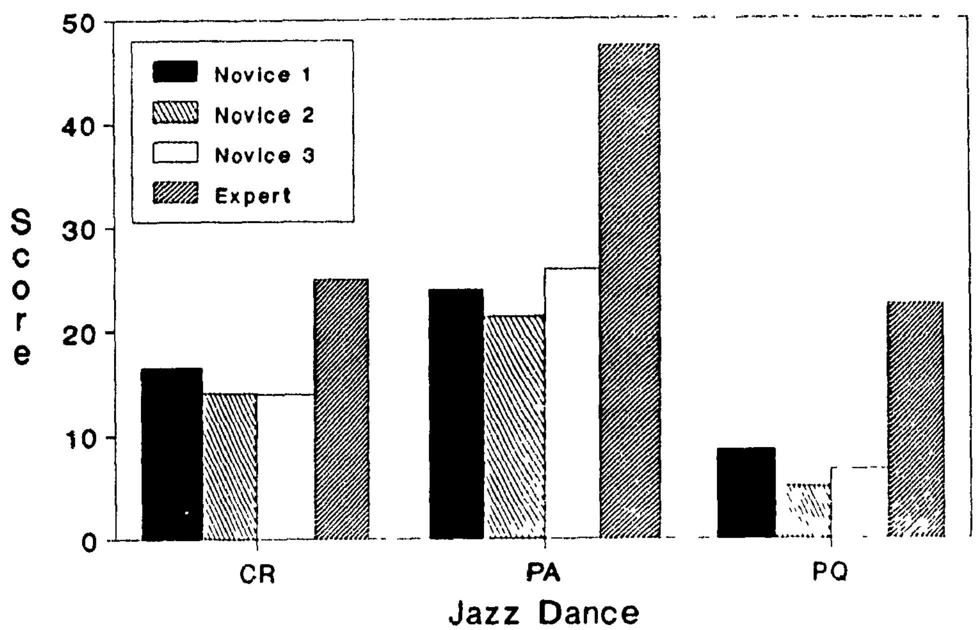

Figure 3.2. Mean scores for response acquisition (CR) and performance reproduction (PA, PQ) for jazz dance by expert and novice dancers.
Novice expertise: 1 = low, 2 = middle, 3 = high.

Note. PA scores are proportionate: 1/13.

Expert-Novice Effects on Learning and Performance

Multivariate analyses of variance (MANOVAs) were performed on the set of three dependent variables--cognitive representation scores, performance accuracy scores, and performance quality scores--for the two dances. Independent variables for the folk dance analysis were expertise and gender, entered in order. Expertise was the sole independent variable in the MANOVA for the jazz dance.

The omnibus MANOVA for the folk dance showed that the combined DVs were significantly affected by expertise (Wilks lambda = .21, F = 7.11, p < .001) but not by gender (Wilks lambda = .86, F = 1.61, p > .05) nor by the expertise-by-gender interaction (Wilks lambda = .79, F = 0.79, p > .05). The results reflected a strong association between expertise and the combined DVs, eta^2 = .79. Similarly, for the jazz dance, MANOVA indicated that the combined DVs were significantly affected by expertise (Wilks lambda = .13, F = 11.93, p < .001). This association between expertise and the combined DVs was also strong, eta^2 = .87.

Pooled within-cell correlations, adjusted for the independent variables (Table 3.3), showed correlations among CR, PA, and PQ in excess of .30. Therefore, stepdown analyses of the prioritized dependent variables was used to investigate the impact of expertise on the individual DVs (see Tabachnick & Fidell, 1989). Based on theory (Bandura, 1986) and empirical evidence (Carroll & Bandura, 1990), the following priority of DVs was developed, from most important to least important: CR, PA, PQ. The highest priority DV, cognitive representation, CR, was tested in univariate ANOVA. Performance accuracy, PA, was then tested in ANCOVA with CR entered as the covariate. The final DV, performance quality, PQ, was tested with CR and PA as covariates.

TABLE 3.3

Pooled Within-cell Correlations Between Response Acquisition Scores (CR) and Performance Reproduction Scores (PA, PQ) of All Dancers on Folk Dance[a] and Jazz Dance[b]

	Cognitive Representation	Performance Accuracy	Performance Quality
Cognitive Representation	--	.47**	.47**
Performance Accuracy	.32*	--	.37*
Performance Quality	.05	.55***	--

Note. [a]above the diagonal. [b]below the diagonal.

$N = 39$.

* $p < .05$. ** $p < .01$. *** $p < .001$.
(Two-tailed test.)

Post hoc contrasts were defined to compare the expert group to the total novice group and each of the four levels of expertise with every other level. To protect against Type I error, Scheffé adjustments of critical F (Tabachnick & Fidell, 1989) were used for all significance decisions.

Experts versus novices--folk dance. When the experts were compared with the total group of novices, unique contributions to predicting differences between the two levels of dance expertise were made by both performance accuracy, stepdown $F(1,30) = 42.9$, $p < .001$, $eta^2 = .59$, and performance quality, stepdown $F(1,29) = 71.3$, $p < .001$, $eta^2 = .71$. After differences due to the cognitive representation were eliminated, experts performed the folk dance with greater accuracy ($M = 636$) than did novices ($M = 439$). Furthermore, after differences measured by performance accuracy were also entered, expert dancers danced with better quality ($M = 24$) than did the novices ($M = 7$). Experts and novices were not distinguishable on the basis of their CR scores on the folk dance (stepdown $F[1,31] = 4.8$, $p > .05$).

Similar results were found when experts were compared to each individual level of novices. Cognitive representation scores were not effective in distinguishing between the expert dancers and any group of novices. Although experts scored higher than the novices, the differences were not significant ($p > .05$). However, performance accuracy contributed significantly to distinquishing between experts and every other group (experts compared to [a] high novices, stepdown $F[1,30] = 17.1$, $p < .01$, $eta^2 = .36$; [b] middle novices, stepdown $F[1,30] = 28.7$, $p < .001$, $eta^2 = .49$; [c] low novices, stepdown $F[1,30] = 44.4$, $p < .001$, $eta^2 = .60$). Mean PA scores were higher for the experts ($M = 636$) than any novice group (Ms, in descending order of expertise = 487, 460, 375). After PA had been entered, performance quality also contributed uniquely to predicting differences between experts and varied levels of novices (experts compared to [a] high novices, stepdown $F[1,29] = 67.5$, $p < .001$, $eta^2 = .70$; [b] middle novices, stepdown $F[1,29] = 81.4$, $p < .001$, $eta^2 = .74$; [c] low novices, stepdown $F[1,29] = 39.0$, $p < .001$, $eta^2 = .57$). Mean PQ scores were higher for the experts ($M = 24$) than any novice group (Ms, in descending order of expertise = 8, 6, 6). Apparently, experts were not able to form significantly better cognitive representations about the folk dance demonstration, at least as measured by the print-resequencing task, than the novices. However, experts were able to reproduce the dance sequence physically with greater accuracy than the novices. In addition, the quality of the physical performances of the experts was significantly higher than that of the novices, even after response acquisition and performance accuracy differences were removed. Results of this analysis are summarized in Table 3.4.

TABLE 3.4

Tests of Post Hoc Contrasts Between Levels of Expertise for Response Acquisition and Performance Reproduction: Folk Dance

Contrast	DV	Univariate F	df	Stepdown F	df	Eta^2
4 vs 1,2,3	CR	4.8	1/31	4.8	1/31	
	PA	53.7[a]	1/31	42.9***	1/30	.59
	PQ	221.9[a]	1/31	71.3***	1/29	.71
4 vs 3	CR	1.9	1/31	1.9	1/31	
	PA	19.9[b]	1/31	17.1**	1/30	.36
	PQ	118.4[a]	1/31	67.5***	1/29	.70
4 vs 2	CR	1.3	1/31	1.3	1/31	
	PA	29.4[a]	1/31	28.7***	1/30	.49
	PQ	168.7[a]	1/31	81.4***	1/29	.74
4 vs 1	CR	8.0	1/31	8.0	1/31	
	PA	64.5[a]	1/31	44.4***	1/30	.60
	PQ	155.0[a]	1/31	39.0***	1/29	.57
3 vs 2	CR	0.1	1/31	0.1	1/31	
	PA	0.7	1/31	1.1	1/30	
	PQ	3.1	1/31	3.6	1/29	
3 vs 1	CR	1.9	1/31	1.9	1/31	
	PA	11.2[c]	1/31	8.6	1/30	
	PQ	1.6	1/31	0.0	1/29	
2 vs 1	CR	2.9	1/31	2.9	1/31	
	PA	6.8	1/31	3.7	1/30	
	PQ	0.3	1/31	2.7	1/29	

Note. [a]Significance level $p < .001$ in univariate context.
[b]Significance level $p < .01$ in univariate context.
[c]Significance level $p < .05$ in univariate context.

* $p < .05$. ** $p < .01$. *** $p < .001$.

All significance decisions based on Scheffé adjustments of critical F to protect against inflated Type I error.

4 = experts; 1, 2, 3 = low, middle, and high novices.

Experts versus novices--jazz dance. Comparison of the experts to the total novice group indicated that all three DVs--cognitive representation, performance accuracy, and performance quality--made unique contributions to predicting differences between the groups. The first contribution was made by CR, the highest-priority DV, stepdown $F(1,35) = 21.8$, $p < .001$, $eta^2 = .38$. Experts acquired more information from the demonstration ($M = 26$) than the novices ($M = 15$). After the pattern of differences measured by cognitive representation was entered, performance accuracy made a unique contribution to distinguishing between experts and novices, stepdown $F(1,34) = 25.7$, $p < .001$, $eta^2 = .43$. Experts danced the jazz sequence with greater accuracy ($M = 616$) than the novices ($M = 307$). Finally, when differences due to CR and PA had both been accounted for, experts performed the jazz dance with greater movement quality ($M = 23$ and 7, experts and novices, respectively), stepdown $F(1,33) = 47.7$, $p < .001$, $eta^2 = .59$.

Similar results were found when experts were compared to each individual level of novices. Cognitive representation contributed significantly to distinquishing between experts and every other group (experts compared to [a] high novices, stepdown $F[1,35] = 16.2$, $p < .01$, $eta^2 = .32$; [b] middle novices, stepdown $F[1,35] = 16.8$, $p < .01$, $eta^2 = .32$; [c] low novices, stepdown $F[1,35] = 10.5$, $p < .05$, $eta^2 = .23$). Experts scored higher on CR ($M = 26$) than any of the novice groups (*M*s, in descending order of expertise = 14, 14, 17). After accounting for differences between groups due to CR, experts were also significantly more accurate at dancing the jazz dance (experts compared to [a] high novices, stepdown $F[1,34] = 13.6$, $p < .01$, $eta^2 = .29$; [b] middle novices, stepdown $F[1,34] = 23.3$, $p < .001$, $eta^2 = .41$; [c] low novices, stepdown $F[1,34] = 22.8$, $p < .001$, $eta^2 = .40$). Mean PA scores were higher for the experts (*M* = 616) than any novice group (*M*s, in descending order of expertise = 336, 276, 310). After PA had been entered, performance quality also contributed uniquely to predicting differences between experts and varied levels of novices (experts compared to [a] high novices, stepdown $F[1,33] = 47.2$, $p < .001$, $eta^2 = .59$; [b] middle novices, stepdown $F[1,33] = 45.4$, $p < .001$, $eta^2 = .58$; [c] low novices, stepdown $F[1,33] = 29.0$, $p < .001$, $eta^2 = .47$). Mean PQ scores were higher for the experts (*M* = 23) than any novice group (*M*s, in descending order of expertise = 7, 5, 9).

For the jazz dance, experts formed better cognitive representations of the demonstration, as measured by the print-resequencing task, than the novices. In addition, experts danced the sequences with greater accuracy than the novices, and their performance quality was significantly better than that of the novices, even after response acquisition and performance accuracy differences were eliminated. Table 3.5 illustrates these results.

TABLE 3.5

Tests of Post Hoc Contrasts Between Levels of Expertise for Response Acquisition and Performance Reproduction: Jazz Dance

Contrast	DV	Univariate F	df	Stepdown F	df	Eta^2
4 vs 1,2,3	CR	21.8[a]	1/35	21.8***	1/35	.38
	PA	59.5[a]	1/35	25.7***	1/34	.43
	PQ	191.4[a]	1/35	47.7***	1/33	.59
4 vs 3	CR	16.2[b]	1/35	16.2**	1/35	.32
	PA	31.2[a]	1/35	13.6**	1/34	.29
	PQ	123.4[a]	1/35	47.2***	1/33	.59
4 vs 2	CR	16.8[b]	1/35	16.8**	1/35	.32
	PA	48.6[a]	1/35	23.3***	1/34	.41
	PQ	159.1[a]	1/35	45.4***	1/33	.58
4 vs 1	CR	10.5[c]	1/35	10.5*	1/35	.23
	PA	39.3[a]	1/35	22.8***	1/34	.40
	PQ	100.4[a]	1/35	29.0***	1/33	.47
3 vs 2	CR	0.0	1/35	0.0	1/35	
	PA	1.4	1/35	1.6	1/34	
	PQ	1.4	1/35	0.3	1/33	
3 vs 1	CR	0.8	1/35	0.8	1/35	
	PA	0.3	1/35	0.7	1/34	
	PQ	1.8	1/35	4.3	1/33	
2 vs 1	CR	0.7	1/35	0.7	1/35	
	PA	0.5	1/35	0.7	1/34	
	PQ	6.7	1/35	7.2	1/33	

Note. [a]Significance level $p < .001$ in univariate context.
[b]Significance level $p < .01$ in univariate context.
[c]Significance level $p < .05$ in univariate context.

* $p < .05$. ** $p < .01$. *** $p < .001$.

All significance decisions based on Scheffé adjustments of critical F to protect against inflated Type I error.

4 = experts; 1, 2, 3 = low, middle, and high novices.

Summary of expert-novice comparisons. The findings partially support the first hypothesis of the study, that expert dancers would acquire more accurate information from the demonstration, as measured by the print-resequencing task, than would novice dancers. Experts generally scored higher than novices on this task, but the difference was significant only for the jazz dance. For the less complex folk dance, novices seemed able to sequence the prints nearly as well as the experts, suggesting that they had acquired as much information as the experts from the demonstration. (It should be noted that if the very stringent Scheffé adjustment of critical F had not been made, the expert-novice difference in folk dance CR scores would have been significant at $p < .04$.)

Stronger support was received for the second hypothesis, that expert dancers would be able to reproduce the demonstrated sequences physically better than novice dancers. For both the folk and jazz sequences, the experts reproduced the demonstrated dances more accurately and with more dancelike quality than the novices.

Effects of expertise on the component elements of the performance accuracy scores. Performance accuracy scores were based on the subject's ability to include the demonstrated actions in the reproduction, to perform them in accurate sequence, to relate them appropriately to the accompanying music, and to present the actions with total body coordination and an accurate use of space. Therefore, these individual components of the performance accuracy scores were analyzed with separate one-way analyses of variance (ANOVAs) to determine whether expert-novice differences occurred within this performance reproduction measure. Only those actions included in a subject's performance could be scored for sequencing, musicality, and precision. Hence, "inclusion" scores were analyzed first. The inclusion scores then acted as covariates in the independent ANOVAs of each of the other measures. Results showed significant differences between the expert and novice groups for every component of performance accuracy.

For the folk dance, experts included more accurate actions (M = 55, SD = 5.0) than the novices (M = 43, SD = 7.6), $F(1,38) = 22.4$, $p < .001$. They also included more accurate actions (M = 59, SD = 5.1) than the novices (M = 38, SD = 11.8) in the jazz dance, $F(1,38) = 30.1$, $p < .001$. After accounting for the differences between the groups in the actions included, experts sequenced the movements more accurately in the folk dance, $F(1,36) = 16.7$, $p < .001$, and the jazz dance, $F(1,36) = 30.8$, $p < .001$. They also presented the actions more musically: folk dance $F(1,36) = 10.2$, $p < .01$, and jazz dance $F(1,36) = 30.2$, $p < .001$. Finally, experts danced both sequences with greater precision by coordinating body, limb, and spatial elements of the sequences: folk dance $F(1,36) = 32.0$, $p < .001$, and jazz dance $F(1,36) = 10.1$, $p < .01$. Means and standard deviations for the components of performance accuracy are reported in Table 3.6 and illustrated in Figure 3.3. Table 3.7 summarizes the results of the ANOVAs for both dances.

TABLE 3.6

Means Scores of Components of Performance Accuracy for Novices and Experts on Folk and Jazz Dances

		Folk Dance		Jazz Dance	
Component	Group	*M*	*SD*	*M*	*SD*
Inclusion	Total	46.2	8.9	43.3	14.0
	Novice	43.1	7.6	37.8	11.8
	Expert	55.4	5.0	59.1	5.1
Sequencing	Total	36.3	10.7	32.7	15.3
	Novice	31.8	7.1	25.7	9.9
	Expert	49.4	8.2	52.8	8.8
Musicality	Total	67.6	25.7	48.2	33.9
	Novice	56.9	18.7	32.4	15.6
	Expert	98.6	16.5	94.2	25.9
Precision	Total	339.1	76.2	262.9	118.4
	Novice	306.9	55.9	211.7	82.2
	Expert	432.4	42.1	411.2	72.5

Note. Experts: *n* = 10. Novices: *n* = 29.

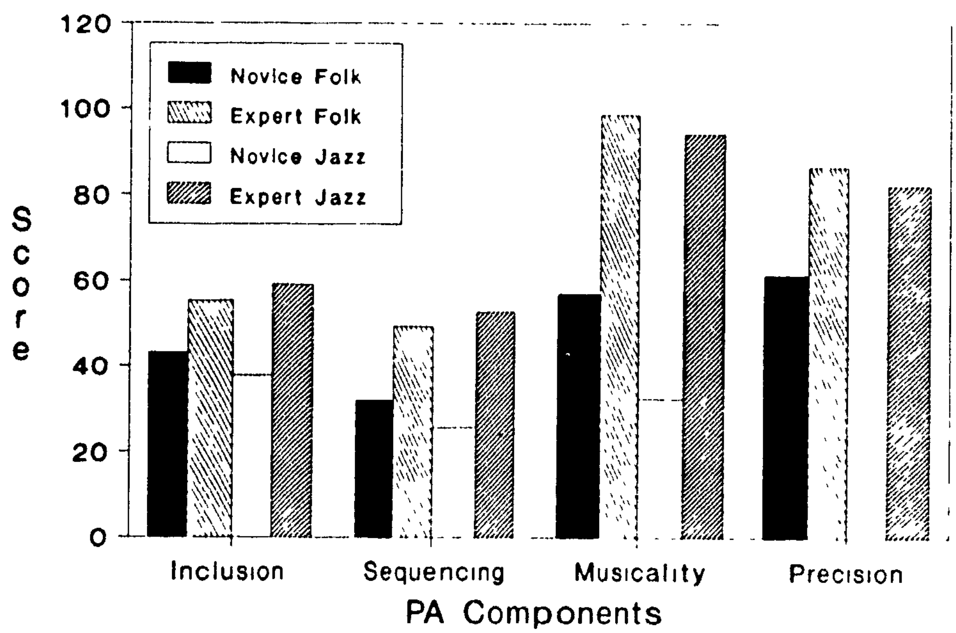

Figure 3.3. Comparison of expert and novice mean scores on components of performance accuracy for the folk and jazz dances.

TABLE 3.7

Summary of ANOVAs of Components of Performance Accuracy Scores Comparing Expert and Novice Dancers for Two Dances

	Folk Dance			Jazz Dance		
DV	F	df	Eta^2	F	df	Eta^2
Inclusion	22.4**	1/38	.38	30.1**	1/38	.45
Sequencing	16.7**	1/36	.32	30.8**	1/36	.46
Musicality	10.2*	1/36	.22	30.2**	1/36	.46
Precision	32.0**	1/36	.47	10.1*	1/36	.22

Note. * $p < .01$. ** $p < .001$.

"Inclusion" was treated as a covariate for the ANOVAs of the other components.

Differences Within the Novice Group

None of the novice supgroups was significantly different from any other on any of the DVs (Tables 3.4 and 3.5). These results do not support the third hypothesis of the study, which proposed that novices with more dance experience and higher levels of basic dance skill would be able to acquire more information and reproduce that information better than novices with less experience and skill. Apparently, expertise, as operationally defined in this study, was not sufficiently different between the groups of novices to influence observational learning of the folk and jazz dances.

Discussion

According to Thomas, French, and Humphries (1986), experts may be defined as those individuals who have a high degree of domain-specific knowledge in contrast to novices who possess only a limited amount of knowledge in the domain. "Experts represent knowledge, process new domain information, and approach problem-solving differently from novices" (p. 261). Hence, in an observational learning experience involving dance sequences, expert dancers would be expected to differ from novices in:

(1) the amount and type of content remembered, the form of the representation, and the content links connecting the elements;

(2) the use of retention strategies and approaches to learning the sequence;

(3) the ability to produce the physical performance from the cognitive representation of the observed behavior and relate the performance to subsequent viewings of the demonstration.

The current study seems to support these expectations.

Amount and Type of Content Recalled

Response acquisition and performance reproduction scores indicated that experts generally recalled the demonstrated dances more accurately than novices. Experts included more correct actions, sequenced them better, and located them more precisely within the overall pattern, although this finding was not statistically significant in the assessment of response acquisition for the folk dance. Visually prominent actions, which tend to capture attention and distort recall by novices, did not seem to interfere with the experts' cognitive representations and overt performances. Instead, these actions were assessed and included appropriately with less dramatic transitional elements. At the same time, experts exhibited precise knowledge and well-defined performances of the overall movement structures, accurately coordinating total body actions with the spatial and temporal aspects of the dances. The experienced dancers seemed to be able to disregard irrelevant stimuli in the demonstration and discern subtleties that the novices were unable to perceive.

Mode of the Cognitive Representation

Although teacher-supplied verbal cues frequently accompany a demonstration to direct attention to important features and enhance retention, no cues were provided in this study. Subjects were required to use their own resources to select and encode the relevant information from the stimuli. The novices rarely expressed the observed behavior in effective verbal terms, perhaps suggesting (a) the lack of a domain-specific vocabulary and/or (b) cognitive representations that were primarily visual. The experts frequently referred to movements verbally, both as they danced and during interviews following their testing.

According to Bandura (1986), transformation of observed activity into either a visual or verbal code is crucial to acquisition of the behavior. Furthermore, linguistic codes seem particularly useful as aids to retention, especially if they are meaningful to the learner (Bandura & Jeffery, 1973). Encoding of the observed behavior into more than one modality may establish an even richer conceptual representation. It seems likely that the expert dancers were able to generate symbolic representations in both imaginal and verbal modes, which would have resulted in more detailed and more clearly developed conceptions of the dances than those produced by the novices.

In addition, an earlier report in this series (Chapter 2) suggested that the pictorial-resequencing task may not always adequately assess the total symbolic representation and some form of kinesthetic representation may exist in addition to verbal and imaginal codes. If this is so, dance experts might be expected to construct those kinesthetic representations of dance, as well as imaginal and verbal representations, more effectively than novices. However, the benefit of kinesthetic representations may not be the same for the print-resequencing and the dancing tasks.

Strategy Use

Novice performers typically have and use fewer strategies than experts, and they are not as flexible in selecting strategies (Magill, 1989). Several examples in this study attest to these facts.

Retention strategies. In addition to defining a verbally based representation, verbal labeling of dance actions frequently involves grouping or "chunking" several movements under a common term. Retention strategies such as labeling and grouping were undoubtedly available to the expert with an expanded knowledge base in dance. Meaningful verbal labels and grouping strategies facilitate recall by focusing attention on key elements of the demonstrated behavior (Bandura, 1986), promoting deeper levels of processing (Craik & Lockhart, 1972), and reducing the amount of information to be processed (Starkes, 1987). The information in memory is more accessible, more easily retrieved. Novices may have been limited in the ability to apply these retention strategies, putting them at a disadvantage in the modeling process.

Use of audio cues. Audio cues have been shown to be important to the development of a cognitive representation of movement timing (Doody, Bird, & Ross, 1985) and, specifically, to the recall of demonstrated dance sequences (Starkes et al., 1987). The novice dancers in this study rarely utilized the musical cues provided. In contrast, the experts obviously recognized them as guides to recall of specific actions and their temporal sequencing. The data indicated that the experts were significantly more accurate musically than the novices.

Physical rehearsal. The experts consistently used physical rehearsal--concurrent with the demonstration, during the resequencing task, and during the free-time periods. Motor rehearsal can be critically important both to the formation of the cognitive representation and to reproduction accuracy, but concurrent matching of a modeled complex action may be very difficult until some conception of the movement pattern has been acquired (Carroll & Bandura, 1987). Many novices did not try to dance during the demonstrations, and the performances of those who did try were usually not synchronized with the model's. Useful motor rehearsal during the demonstrations may have been impossible for the novices if the time limitations of the study did not permit adequate development of the cognitive representation.

The potential of a kinesthetic representation of the observed actions may explain, in part, the frequent overt behavior exhibited by the experts during the print-resequencing task. They may have been translating information between the kinesthetic and visual modes. If a similar kinesthetic mode of representation was not well developed for the novices, dancing as they arranged the photos would have been of little use. Few novices danced while sequencing the prints.

Physical rehearsal appears to be particularly useful in observational learning situations of complex activity where the observers must generate their own symbolic guides for reproduction. Motor rehearsal helps learners organize and analyze what they know and focuses their attention on weak points in their conceptual representations of the behavior (Bandura, 1986). The ability to use this learning strategy may have been a contributing factor to the expert-novice differences found in this study.

Mental practice. Three novices stated that they had used mental rehearsal during the free time to help them remember the demonstrations, but it was impossible to assess. Results indicated that if mental rehearsal was being used by these novices, it was not very effective. Learners who observe complex activities in their entirety, as occurred in this study, may have difficulty acquiring all of the information needed to establish an accurate cognitive representation, which is necessary for effective mental rehearsal (Bandura, 1986). The novice dancers may again have been handicapped in their ability to use a rehearsal strategy.

Summary. Differences between the expert and novice dancers in their use of retention strategies such as labeling and grouping, audio cues supplied by the musical accompaniment, and rehearsal were clearly apparent in this study. These variances in strategy use undoubtedly contributed to the variability in response acquisition and performance reproduction.

Approaches to the Observational Learning Task

General approaches to learning the sequences also differed between the two major levels of dance expertise. Based on verbal reports and the posttest questionnaire, it was clear that novices tended to focus on only a few characteristics of the dances: the beginning and end, or undefined "segments" progressing chronologically from the beginning. This approach may have been fairly effective for the folk dance in which each quadrant of the pattern was a self-contained unit with quite obvious repetitions. However, observers who used this acquisition method often failed to identify the repetition in the second half of the jazz dance. Novices also stated that they frequently limited their focus to foot actions, general spatial characteristics of the dances, or isolated arm movements. This approach probably left the novices with incomplete cognitive representations of the dances, thus hindering their ability to sequence the still prints and perform the dances with accuracy and style.

On the other hand, verbal reports by the experts, plus observation of their behavior, indicated that they consistently made a global inspection of the sequential patterns of each dance in initial viewings of the demonstrations. Furthermore, they observed units of movement rather than isolated parts. The experts apparently attended to and recalled total body actions in space and time, their accompanying style characteristics, and their relationships to other actions in the sequence. Similar to experts in other domains, the dance experts seemed to be able to acquire a large amount of information in a short period of time (Allard & Burnett, 1985).

Expertise Effects on Performance Reproduction

Social cognitive theory indicates that the expert-novice differences already cited, which relate primarily to the formation of an internal conception of the dances, might be sufficient to account for many of the expert-novice contrasts observed in this investigation. The formation of an accurate cognitive representation during response acquisition is critical to successful replication of the observed behavior (Carroll & Bandura, 1990). In support of this belief, results of the current study showed that the size of the effect of expertise on performance accuracy dropped by 4% and 20% for the folk and jazz dances, respectively, when the cognitive representation differences were partialled out. However, effect sizes for expertise on performance accuracy, folk 59% and jazz 43%, and quality, folk 71% and jazz 59%, remained impressive for both dances even after accounting for differences in the cognitive representation. Experts in dance apparently have additional resources that novices do not have that enable them to replicate observed dance patterns.

Undoubtedly, expert dancers possess a repertoire of accessible physical movements that facilitate the translation of the symbolic representation into skillful overt performance. In addition, they are probably able to compare their overt performances to the internal conception, identify discrepancies, and determine modifications for the next performance (Carroll & Bandura, 1987). If necessary, additional information can be acquired from the demonstration by focusing their attention on parts of the display for which the cognitive representation is found deficient. Novices in dance may lack both the movement skills for replicating observed dance and a well-developed internal reference system for identifying errors in their overt performances. Procedural knowledge and movement ability are crucial components of skilled motor performance and "probably enhance the acquisition and retention of declarative knowledge" (Starkes & Deakin, 1984, p. 123).

Expertise Effects Related to the Two Dance Styles

Expert-novice differences on the two dance styles are also of interest. The pattern of the folk dance was less complex and its structure was more apparent than that of the jazz dance. The folk dance contained more repetitions of similar movements, and repetitions were grouped. Individual actions were less complex with fewer changes in the precision features of the actions. These characteristics would have simplified attentional focusing and reduced the amount of information to recall and to recognize in the still prints. The more complex structure of the jazz dance would have increased the cognitive processing required of the observer during the demonstration and during the print-resequencing task. The differing complexities of the individual movements and their sequential arrangements in the two sequences would also be expected to affect reproduction accuracy, with the folk dance being "easier" to dance than the jazz dance.

It was expected that CR scores would be higher for the folk dance than the jazz dance due to these complexity differences. However, experts scored similarly on the CR task for the two dances. The experts may have reached a ceiling on how well they could do on the resequencing task, within the confines of the study. In contrast, the novices were able to score almost as well as the experts on the folk dance CR task but were significantly less successful than the experts on the jazz dance CR task. Under the protocol of the study, the less complex folk dance may not have allowed for enough variance in the cognitive representation task to distinguish between the expert and novice dancers. The more complex jazz dance allowed expert-novice differences in the CR scores to appear.

On the other hand, the results may illustrate the belief that in some situations response acquisition may be quite extensive, but the observer may not be able to replicate the behavior physically (Martens, Burwitz, & Zuckerman, 1976). Depending on the cognitive and physical demands of the task, response acquisition could be similar for different levels of expertise, but the ability to translate the cognitive representation into a physical replication of the demonstration might still differ. According to results of the print-resequencing task, the novice dancers were able to acquire a similar amount of information from the folk dance demonstration as did the experts. However, they did not dance the sequence with the accuracy and qualitative characteristics of the expert dancers. This result emphasizes the need to assess both the cognitive learning of response acquisition and the overt performance following a demonstration. In this case, practice to develop the physical skills to replicate the demonstrated movements appears to be necessary rather than repetition of the demonstration, which might benefit response acquisition.

Novice dancers seemed to be at a disadvantage in both phases of observational learning for the more complex, less structured jazz dance. Apparently, differences in expertise were critical to both the acquisition of the demonstrated sequential behavior of the jazz dance and its physical reproduction. The novice dancers seemed to be more affected by the structural differences between the two dances than were the experts. As shown in Figure 3.4, the novices achieved less both cognitively--although this was not significant for the folk dance--and physically than the experts on both dances. Furthermore, they were less successful on the jazz dance than the folk dance, with the exception of the performance quality measure. In contrast, response acquisition and performance reproduction by the experts were similar for the two styles. In this study as in the Starkes et al. (1990) study, structure of the observed dances did not appear to affect expert learning and performance. Apparently, the expert dancers were able to acquire information from the demonstration using spontaneous strategies of recall that did not rely on information structure. Like those in the Starkes et al. work, these experts had had considerable modern dance training, which may have enhanced this ability.

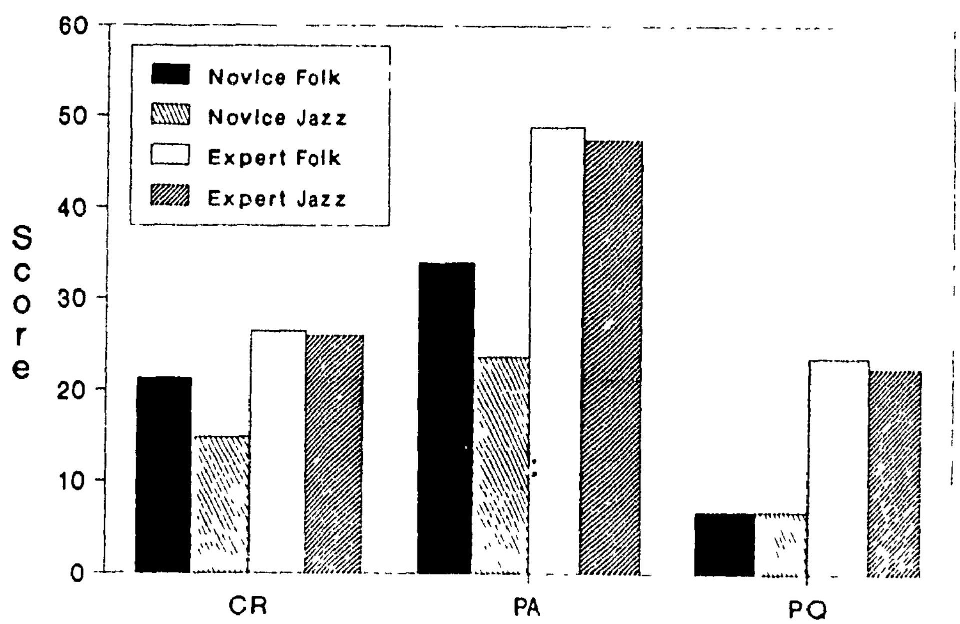

Figure 3.4. Mean response acquisition (CR) and performance reproduction (PA, PQ) scores for expert and novice dancers on folk and jazz dances.

Note. PA scores are proportionate: 1/13.

Experience Within the Novice Group

Lack of support for the third hypothesis of the study, which predicted superior cognitive and physical performance by novices with more dance experience, probably resulted from the very low level of dance experience of the majority of the novices or an inability to get a sufficiently accurate assessment of this experience. In any case, the three novice subgroupings used in this study apparently were unable to describe clear differences in expertise amongst the novice dancers. Further research with novices who have a wider range of experience in dance might produce different results.

Another aspect of the expertise continuum might also be considered: the effect of other types of motor skill experience on the observational learning of dance. The novice dancers in this study possessed considerable amounts of movement experience in a variety of activities other than dance, and variations in observational learning did appear within the novice group. Hence, other questions arise. What effect do movement experiences other than dance have on modeling in dance? Are some movement experiences more valuable than others in enhancing observational learning in dance? Questions such as these merit further research.

Conclusions

Under the conditions of this study, expert-novice differences in dance affected both phases of observational learning. However, the effects of expertise may also be related to specific ask characteristics, particularly complexity and inherent organizational features. Acquiring pertinent information from a demonstration of dance, encoding that information for successful storage in- and retrieval from memory, and translating the covert representation into an accurate and quality overt performance appear to require skills that accompany expertise in dance. Results of this study support previous research findings and may contribute to an understanding of the complexities of both the modeling process and proficiency-related differences in learning and performing dance.

It should be noted that the modeling procedures used in this research are not totally realistic nor are they considered appropriate for effective teaching and learning. Demonstrating sequences in their entirety to novice learners overloads the observers' processing systems, often resulting in erroneous observational learning. Presenting smaller segments of complex sequences and focusing on specific component movements leads to better skill acquisition. Providing verbal cues and knowledge of results directs attention and helps learners acquire the information more efficiently and accurately. Observational learning would likely have been considerably improved for virtually all subjects, but especially for the novices, had teaching techniques such as these accompanied the demonstrations and supplemented physical performances.

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The effects of domain-specific expertise on observational learning in dance were investigated in Chapter 3 with results generally supporting previous research findings. However, it was noted that students who have minimal dance experience may have considerable amounts of nondance movement experience that could influence observational learning in dance. In Chapter 4, varied movement experience is considered for its potential effect on the ability to learn from dance demonstrations. The results of the study are partially descriptive, reflecting the preliminary nature of these considerations.

CHAPTER 4

EFFECTS OF VARIED MOTOR SKILL EXPERIENCE ON THE OBSERVATIONAL LEARNING OF DANCE SEQUENCES BY BEGINNER DANCERS

ABSTRACT

Although domain-specific expertise has been shown to affect dance observational learning, little is known about the effects of general motor skill experience on the process. In this study, university-aged beginner dancers with varied movement experience observed dance demonstrations, sequenced still prints representing the dances, and performed the sequences. Measures of basic dance skill and experience in dance, in sports similar to dance, and in all other sporting activities were considered for their ability to predict modeling success before and after an elementary dance course. Both group and individual data were evaluated. Results indicated that entry-level dance skill is the best present indicator of initial success in dance modeling. Inexperienced dancers can improve observational learning skills within the context of a dance course. Entry-level observer characteristics other than those addressed may also affect modeling success and should be identified in future research.

EFFECTS OF VARIED MOTOR SKILL EXPERIENCE ON THE OBSERVATIONAL LEARNING OF DANCE SEQUENCES BY NOVICE DANCERS

Dance has become a popular recreational, social, and fitness activity for all ages and is recognized as an important component of elementary- and secondary-school physical educational curricula. Dance lessons are no longer just for little girls and professionals-in-training. As a consequence, instructors in studios, recreation outlets, schools, and university teacher-training programs are encountering classes of students with widely varied needs and desires. They come to develop the physical, rhythmic, expressive, and, sometimes, teaching skills that are similar to those of other motor skills but, at the same time, are unique to dance. They may or may not know much about dance when they arrive. The instructor requires substantial knowledge to promote effective learning within these classes of students with varied movement expertise.

The effects of dance expertise on the acquisition and recall of dance patterns in early learning experiences seem to be similar to those found for expertise in other skill domains (Starkes, Caicco, Boutilier, & Sevsek, 1990; Starkes, Deakin, Lindley, & Crisp, 1987). Experts typically recognize and remember more information more accurately than novices when both are briefly exposed to new material under similar conditions. An earlier study in this series also suggests that, during an acquisition period that provides physical practice interspersed with repeated demonstrations of the material, dance experts are able to learn relatively long sequences of dance and produce those sequences physically with greater precision and style than less experienced dancers (Chapter 3). Experts apparently employ a variety of learning strategies and possess cognitive and physical skills that enhance both learning and performance.

Results of these studies of dance expertise may help teachers establish an appropriate progression of goals for student learning and, thereby, improve the efficiency of the dance teaching-learning process. However, another factor with the potential to influence this process is motor skill experience in general. Students with minimal dance experience may have considerable expertise in a variety of physical activities other than dance. These motor skill experiences may have an impact on initial learning in the dance class and on the ability to develop the skills for future dance learning.

One important skill that might be affected by varied motor skill experiences is the ability to learn from demonstrations. Demonstrations of desired movement patterns are frequently used to convey information to the learner. The assumption is that the observer/learners will be able to utilize the information to acquire new skills and patterns or refine those already in their movement repertoires. This modeling or observational learning process begins with the observer's ability to recognize and remember relevant information presented by the demonstration. Bandura (1986) refers to this phase of the process as response acquisition. For accurate reproduction of the behavior, learners must also have the physical skills and motivation to replicate the observed actions. This second phase of the process is known as performance reproduction. Characteristics of the observer such as age, gender, and prior experience and skill level in the specific domain have been shown to affect both phases of the modeling process (e.g., Chapter 3; Del Rey, 1978; Downey, 1988; Thomas, Pierce, & Ridsdale, 1977; Weiss & Klint, 1987). However, research to enhance our understanding of the potential relationship of general motor skill experience to observational learning in a specific domain has not been documented. Effects of the observer's nondance motor skill experience on response acquisition and performance reproduction in a dance observational learning situation are unknown.

Purpose of the Study

This study examined observational learning of dance by relatively inexperienced dancers who had had various types and amounts of other motor skill experiences. One of the first concerns of any instructor is: How will the entry-level characteristics of the students influence the teaching-learning process? Entry-level variables such as previous experiences and acquired skills are expected to affect the student's ability to understand and assimilate the information presented and to develop the skills needed for performance in the present situation. Hence, the first question addressed in this study was: For beginning dancers, can measures of basic dance-movement skill and prior motor skill experiences predict initial success in the observational learning of dance?

Instructors are concerned not only with initial success but also with changes that occur over an instruction period. In a motor skill acquisition setting, the product, physical performance of the specific skill(s) during and at the conclusion of the session, is one measure of change. However, the learning process is also important, and development of the skills that will enhance future learning in the domain is of particular value. Entry-level learner characteristics might have an effect on the student's ability to acquire those skills needed to learn efficiently in a specific instructional situation. Therefore, the second basic question was: What are the characteristics of students who benefit the most from instruction? In particular, the study considered the entry-level experience characteristics of beginner dance students who were able to learn more from a dance demonstration after an elementary course in folk dance than they were before the course.

Method

Subjects

Twenty-nine physical education majors (14 females, 15 males; M age = 21.8 years) at an English university in Montreal, Québec, volunteered to participate in the study (Appendix A). They were tested over a 10-day period early in January 1990 and again at the end of March 1990. Between the two testing sessions, all subjects participated in a credit folk dance course in which they were enrolled as part of their regular professional program.

Assessment of Basic Dance Skills and Motor Skill Experience

The subjects were assessed for dance skill level on a series of basic movements used in beginner dance instruction (Appendix F). Performances of each of the 11 skills were rated by five dance instructors on a 0-to-5 point scale. Basic dance skill scores were determined for each subject by summing the totals for the 11 skills over the five raters (maximum = 275).

Questionnaires to assess prior experience in dance, "related sports", and "other sports" were also completed by all subjects before the observational-learning testing began (Appendix E). Related sports were operationally defined as those sports similar to dance, such as figure skating and gymnastics, in which the performer is primarily concerned with producing a specifically defined motor pattern, perhaps requiring recall of a lengthy sequence of movements (Deakin & Allard, 1991). Other sporting activities (e.g., tennis, swimming, team sports) were included in the category labeled other sports. Experience scores for each of these three motor skill categories were based on the time involved, after the age of five, in all of the activities relevant to the category. Involvement time reflected estimated participation time, skill level influences, teaching/coaching experience, and time spent observing each activity. The experience scores for dance, related sports, and other sports were converted to standardized scores (Z scores) for use in statistical analyses.

Additional Subject Information

Following the first testing in January, each subject answered another questionnaire focusing on learning strategies used during the observational learning process (Appendix G). Field notes taken by the experimenter during both observational learning testings, videotaped recordings of the testing sessions, and informal interviews with the subjects following the final testing in March (recorded in written form by the experimenter) supplemented the other data.

The Dance Course

One-hour classes were held twice a week for the nine weeks of the folk dance course. Content and methodology were not altered in any way for the study but followed procedures that this teacher had used for the same course in previous years. Goals of the course were to develop (a) basic folk dance footwork and patterning, (b) a working knowledge of the methodology for teaching beginning folk dance to elementary- and secondary-school students, (c) teacher observational skills important for task and movement analysis, and (d) the ability to translate written dance notes into lessons and ultimately into refined overt performances.

Procedures

A detailed description of the procedures used to assess response acquisition and performance reproduction appeared in an earlier report (Chapter 2). Therefore, only an outline will be given here. In general, subjects observed videotaped demonstrations of folk and jazz dance sequences, each approximately 30 seconds in length (Appendix B), arranged still photos of the movements of each sequence to represent the sequential order of the actions, and physically performed the dances. All subjects were tested individually in January (pretest) and again in March (posttest). Order of presentation of the dances was counterbalanced within the group and was the same for a given subject during the pretest and posttest.

For each dance, four acquisition trial blocks were allowed, during which subjects observed the dance nine times, attempted to sequence the photos four times (two minutes for each trial with the prints left in place following each trial), and danced the sequence eight times. Scores for the analyses were obtained from a fifth trial block for each dance. During this block, no demonstrations were provided; subjects arranged the prints once and danced the sequence twice.

For each dance, the final arrangement of the prints was scored for positioning and sequencing (maximum = 51 and 59 for folk and jazz, respectively). This score was defined as the cognitive representation (CR) score and was considered to be a measure of response acquisition (Carroll & Bandura, 1982). In addition, videotaped recordings of each subject's performances of the dances were assessed for accuracy and quality. Performance accuracy (PA) was based on the inclusion, sequencing, musicality, and precision of the component actions. The mean of the PA scores of the final two performances was used in analyses (maximum = 743 and 767 for folk and jazz, respectively). Three expert judges then rated the most accurate (highest PA score) of the two final performances for performance quality (PQ) on a scale of 1-to-10, and these scores were summed (PQ maximum = 30 for each dance). Performance accuracy and performance quality were defined as components of performance reproduction.

Results and Discussion--Part I

The concerns of this investigation focused on the potential effects of the entry-level motor skill experience characteristics of beginner dancers on their ability to learn from dance demonstrations. The first area of interest was related to initial learning and performance, such as a teacher might expect from novice students observing dance at the beginning of an elementary dance course. Results of this analysis are based on data collected before the students participated in the folk dance course. In addition to group data, individual experience profiles of subjects who scored particularly well or poorly on the observational learning measurements were considered.

Dance Skill and Other Motor Performance Experience as Predictors of Observational Learning Ability in Dance

The first question was whether basic dance skills and prior experience in dance, related sports, and other sports could be used to predict successful observational learning of dance. Means for the dependent variables (CR, PA, PQ) and for the four independent variables--basic dance skill, dance experience, related-sport experience, and other-sport experience--are shown in Table 4.1.

TABLE 4.1

Means and Standard Deviations of Dependent Variables (CR, PA, PQ) and Dance Skill and Three Experience Variables for Folk and Jazz Dances on the Pretest

Variable	Mean	SD	SE_{MEAN}
Folk			
CR	21.2	7.1	1.32
PA	439.3	85.7	15.91
PQ	6.6	3.2	0.59
Jazz			
CR	14.8	5.0	0.93
PA	306.7	108.1	20.07
PQ	6.8	3.1	0.58
Dance Skill	130.9	28.6	5.31
Experience[a]			
Dance	0.0	2.0	0.37
Related Sports	0.0	2.0	0.37
Other Sports	0.0	2.2	0.41

Note. [a]Experience variables were all sums of z-scores.

Maximum possible scores:
Folk dance -- CR = 51, PA = 743, PQ = 30.
Jazz dance -- CR = 59, PA = 767, PQ = 30.
Dance skill = 275.

Domain-specific expertise can affect both response acquisition and performance reproduction in the observational learning of dance (Chapter 3). In addition, Deakin and Allard (1991) suggest that there seem to be similarities in the cognitive skills required for proficient performance, and probably learning, by gymnasts, figure skaters, and dancers, as compared to athletes in many other sports. Therefore, hierarchical regression was employed to assess the relationships between the scores representing observational learning (CR, PA, PQ) and the set of independent variables (IVs = basic dance skill, dance experience, related experience, and other-sport experience). Basic dance skill scores were entered into the equation first because physical skill in an activity may affect observation of that activity (Petrakis, 1987; Vickers, 1988). Dance experience, related experience, and other-sport experience followed in order. The question of interest was whether the experience variables contributed to the prediction of observational learning after differences in higher priority variables had been statistically removed (see Tabachnick & Fidell, 1989).

Table 4.2 displays the bivariate correlations between the independent variables and the three dependent variables reflecting response acquisition (CR scores) and performance reproduction (PA and PQ scores) for both dances for the pretest. Dance skill had positive, significant correlations with (a) all of the dependent variables for the folk dance, CR $r = .39$, $p < .05$; PA $r = .65$, $p < .001$; PQ $r = .46$, $p < .05$, and with (b) performance accuracy for the jazz dance, $r = .42$, $p < .05$. Dance experience was positively correlated with performance quality for the folk dance, $r = .49$, $p < .01$. Furthermore, its relationship with folk dance CR and PA and with jazz dance PA approached significance

($p < .10$). Dance skill and dance experience were positively correlated with one another, $r = .41$, $p < .05$, as expected.

No other experience variables exhibited significant correlations with any of the modeling measures for either dance ($p > .05$). However, the negative correlations of other-sport experience with performance quality, folk dance $r = -.33$, jazz dance $r = -.31$, approached significance, $p < .10$.

TABLE 4.2

Correlations Among Observational Learning Scores (CR, PA, PQ), Dance Skill, and Experience Variables for Folk and Jazz Dances on the Pretest

DV	Dance Skill	Experience Variables: Dance	Experience Variables: Related Sports	Experience Variables: Other Sports
Folk				
CR	.39*	.34[a]	.14	-.04
PA	.65***	.34[a]	.26	-.15
PQ	.46*	.49**	.01	-.33[a]
Jazz				
CR	.19	-.03	.10	-.22
PA	.42*	.32[a]	.21	-.27
PQ	.07	.07	-.03	-.31[a]
Experience Variables				
Dance	.41*			
Related Sports	.10	.05		
Other Sports	-.31[a]	-.21	.12	

Note. N = 29.

* $p < .05$. ** $p < .01$. *** $p < .001$.

[a] $p < .10$.

(Two-tailed tests for all correlations)

Results of regression analyses. Summaries of the regression analyses of the individual measures of observational learning (pretest CR, PA, PQ scores) on dance skill and the three experience variables appear in Tables 4.3 and 4.4 for the folk and jazz dances, respectively. Unstandardized regression coefficients (B) and intercept, standardized regression coefficients (β), squared semipartial correlations (sr^2), R, R^2, and adjusted R^2 after entry of all independent variables are given.

For the folk dance, the bivariate relationship of dance skill with each of the three dependent variables, assessed at the end of step one, was significant and positive. Dance skill accounted for (a) 15% of the variance in the CR scores, $R = .39$, $F_{inc}(1,27) = 4.95$, $p < .05$; (b) 43% of the variance in the PA scores, $R = .65$, $F_{inc}(1,27) = 20.00$, $p < .001$; and (c) 22% of the variance in the PQ scores $R = .46$, $F_{inc}(1,27) = 7.42$, $p < .05$. None of the experience variables significantly improved R^2 at its point of entry into the prediction equation for any of the dependent variables ($p > .05$). However, for performance quality, the addition of dance experience resulted in an increment in R^2 that approached significance ($F_{inc}[1,27] = 4.10$, $p = .053$, $sr^2 = .11$). For PA and PQ, R was significantly different from zero when all four independent variables had been entered into the equation, PA: $R = .69$, $p < .01$; PQ: $R = .59$, $p < .05$.

TABLE 4.3

Hierarchical Regression of Observational Learning Scores (CR, PA, PQ) on Dance Skill and Experience Variables for the Folk Dance in the Pretest

DV	IV	B	β	sr^2	R^2	AdjR^2	R
CR	Skill	0.080	0.32	.15*		.12	
	Dance	0.806	0.23	.04			
	Related	0.293	0.08	.01			
	Other	0.321	0.10	.01	.21	.08	.46
	Intercept =	-3.427					
PA	Skill	1.874	0.63	.43***		.40	
	Dance	3.712	0.09	.01			
	Related	8.279	0.20	.04			
	Other	1.598	0.04	.00	.47	.39	.69**
	Intercept =	64.524					
PQ	Skill	0.031	0.28	.22*		.19	
	Dance	0.553	0.34	.11[a]			
	Related	-0.028	-0.02	.00			
	Other	-0.244	-0.17	.02	.35	.24	.59*
	Intercept =	-0.263					

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

[a] $p = .053$.

sr^2 = squared semipartial correlation

For the jazz dance, dance skill contributed significantly to the equation for PA scores, accounting for 18% of the variance, $R = .42$, $F_{inc}(1,27) = 5.74$, $p < .05$. No other IV added significantly to any of the predictions at its point of entry into the equation, and R was not significant ($p > .05$) for any of the DVs after all four IVs had been entered into the equations.

TABLE 4.4

Hierarchical Regression of Observational Learning Scores (CR, PA, PQ) on Dance Skill and Experience Variables for the Jazz Dance in the Pretest

DV	IV	B	β	sr^2	R^2	AdjR^2	R
CR	Skill	0.031	0.18	.04			
	Dance	-0.384	-0.15	.01			
	Related	0.275	0.11	.01			
	Other	-0.482	-0.21	.04	.10	-.05	.31
	Intercept =	16.686					
PA	Skill	1.047	0.28	.18*		.14	
	Dance	8.880	0.16	.03			
	Related	10.710	0.20	.03			
	Other	-8.765	-0.18	.03	.26	.14	.51
	Intercept =	61.397					
PQ	Skill	-0.005	-0.04	.00			
	Dance	0.032	0.02	.00			
	Related	0.016	0.01	.00			
	Other	-0.457	-0.32	.09	.10	-.05	.32
	Intercept =	11.456					

Note. * $p < .05$.

sr^2 = squared semipartial correlation

Summary. Under the conditions of this study, subjects with better initial skills in basic dance movements were the most successful at both learning and performing the folk dance following a demonstration. The amount of dance and sport experience that these beginner dancers had added no more to the prediction of observational learning ability. The findings reinforce the belief that domain-specific expertise affects both phases of the observational learning process. They also agree with studies than have suggested that physical skill level in an activity, rather than simply the amount of experience, may (a) influence observation of that activity, specifically in relation to what information is attended to (Petrakis, 1987; Vickers, 1988) and (b) enhance encoding of pertinent information to facilitate its recall (Deakin & Allard, 1991). The findings also support the dance teacher's belief that entry-level skill in basic locomotor and rhythmic components of dance can be a good predictor of initial learning abilities in dance. The use of audition classes to screen dancers for placement in instructional situations seems to be appropriate.

For the jazz dance, students with better basic dance skills performed the dance with greater accuracy. However, the lack of any other significant findings relating motor skill experiences to the students' ability to learn and perform the jazz dance suggests that factors other than those assessed in this study contributed to the differences in the observational learning scores. This is probably true for the folk dance, too, although to a lesser degree. Total population variance accounted for in the observational learning of the folk dance ranged from 8% to 39% for the three measures, leaving a large portion of variance undefined by the dance skill and experience scores. Further research is needed to determine what other entry-level characteristics affect the observational learning process for beginner dancers and how those characteristics interact with types/styles of dance that seem to require different attentional and retention skills (Starkes et al., 1990) and, perhaps, physical abilities.

Dance Skill and Prior Experience Characteristics of Specified Individuals Among the Novice Dancers

To further examine the influence that basic dance skills and prior motor skill experiences might have on the observational learning ability of novice dancers, a qualitative appraisal of the data related to specific individuals was made. The primary goal of the investigation was to understand differences between observers who are successful at acquiring and reproducing information presented by a demonstration and those who are not. Hence, subjects selected for this analysis were those who had scored at the extreme ends of the continuum of scores for response acquisition or performance accuracy.

Performance quality scores were not considered because the judges who rated the dancers all described a phenomenon that apparently affected performance quality: These beginners generally exhibited a very limited ability to dance with style and expression (*M*s = 6.6 and 6.8 for folk and jazz dances; maximum possible = 30). This characteristic was frequently related to the inability to reproduce the sequence of movements accurately, as indicated by the correlations between PA and PQ ($r = .59$, $p < .001$ for folk dance, and $r = .63$, $p < .001$ for jazz). Most subjects with low performance quality scores also had difficulty recalling the sequential movement pattern. However, some novice dancers seemed to possess an inherent "movement quality" that manifested itself in the overt performance, even though the subject did not necessarily produce the dance with content accuracy. Therefore, because the PQ scores may have reflected something additional to observational learning, only cognitive representation scores (CRF and CRJ for folk and jazz dances, respectively) and performance accuracy scores (PAF and PAJ, folk and jazz dances) were considered in this examination of the skill-and-experience profiles of individual subjects.

Selection of the individuals and the pertinent data. For each dance, the five highest and five lowest pretest scores for CR and PA were noted. This resulted in (a) 20 high scores: five each for CRF, PAF, CRJ, and PAJ, and (b) 20 low scores: five each for CRF, PAF, CRJ, and PAJ. The subjects who had achieved these scores were identified. A subject may have had one of the five highest or lowest scores on any single variable (CRF, PAF, CRJ, PAF) or on several variables. The basic dance skill scores of these selected students and their responses to the experience questionnaire (Appendix E) were reviewed. An attempt was then made to describe entry-level characteristics of those who did exceptionally well or poorly on one or more DV on the pretest. This information was supplemented by field notes taken during testing and by responses to the questionnaire related to learning strategies, which subjects completed following the pretest (Appendix G).

Experience profiles of high scoring observers. Twelve subjects shared the 20 highest modeling scores (five scores each for CRF, PAF, CRJ, & PAJ). Eleven of the twelve had basic dance skill scores between 121 and 188, above or less than one SD below the mean of 131 (SD = 28.6). This finding agrees with the statistical results, supporting the important contribution of physical skill to observational learning ability. Additional descriptions of the experience profiles of these 12 students are based on the following DV means for the sample: CRF = 21, PAF = 439, CRJ = 15, PAJ = 307.

(1) Two subjects scored highly in all four categories: CRF = 27, 40; PAF = 580, 523; CRJ = 21, 20; PAJ = 487, 498. They had the highest basic dance skill scores of the entire sample, 173 and 188, as well as the most dance experience, 6.4

and 5.0, M = 0.0, SD = 2.0, thus confirming predictions related to the influence of domain expertise.

(2) One subject had high scores for both CR and PA for the folk dance, CRF = 32, PAF = 549. Another had high scores for both for the jazz dance, CRJ = 21, PAJ = 466. These two students had related-experience scores that were 3.8 and 2.5 SDs, respectively, above the mean. Both had considerable experience in gymnastics, including several years of coaching. The student with the highest related-experience score also had several years of diving experience. These findings suggest that exposure to motor skill activities similar to dance may enhance both of the phases of observational learning for dance. Teaching or coaching experience may be of particular value because accurate observation of task performance is a primary requisite of good instructing (Barrett, 1981). In this case, observational skills developed while coaching gymnastics or diving may have transferred to observing dance. The results also reinforce Bandura's (1986) theory linking response acquisition and performance reproduction in modeling.

(3) One subject who scored well on response acquisition for the folk dance, CRF = 29, had a score for other-sport experience that was 3.8 SDs above the mean, mostly related to the hours spent coaching swimming. Swimming appears to be somewhat similar to dance with respect to the need to produce a consistently accurate movement pattern. Individuals with extensive coaching experience in swimming would probably have

well-developed observational skills, enabling them to critically analyze the precision of the learning-swimmer's actions. Similar to the instances noted previously, those observational skills may have been transferable to the observation of the repetitive movements of the folk dance.

(4) A subject who scored highly in two of the four categories, CRF = 37 and PAJ = 435, did not appear to have any particular strengths related to dance skill and prior experience. Scores for all experience variables were within one SD of the mean. However, it was noted that this was a final-year student who had finished most of the required athletic skill courses, had completed all practice teaching sessions, and had expressed a strong interest, although not much experience, in music and dance. Furthermore, the subject reported making a conscious effort to identify patterns within the dances, recognized the repeated pattern in the jazz dance, and assessed the prints with great care. Apparently, learning strategies were well established and had probably been enhanced by a general, if not specifically extensive, background of motor skill participation and instructing experiences.

(5) No apparent explanations relating to prior experience were found for the remaining six subjects with high scores on a single response acquisition or performance reproduction variable.

Experience profiles of low scoring observers. Thirteen subjects shared the 20 lowest modeling scores (five scores each for CRF, PAF, CRJ, PAJ). No one was in the lowest group for all four categories. Of the 13, ten were within one SD of the mean for basic dance skill, 105 to 158, but three were below one SD of the mean with scores of 64, 81, and 90. Analyses of the data suggested the following:

(1) The two students with low scores on three of the DVs, CRF = 14 and 12, PAF = 271 and 246, PAJ = 186 and 172, were 1.4 and 2.3 SDs below the mean basic dance skill score. Because they were within one SD of the mean on all experience variables, it seems likely that their difficulties with the modeling tasks were related to a lack of knowledge and expertise in basic dance movement and rhythmic skills. Such a deficit would be expected to hinder both phases of the modeling process in a dance situation. This result again coincides with the statistical findings, illustrating the importance of domain-specific skill to success in dance observational learning.

(2) The jazz dance seemed to provide particular difficulty for two subjects. They were in the lowest group for both CRJ, 6 and 10, and PAJ, 83 and 129. Their basic dance skill scores and experience scores were within one SD of the mean, with one exception: a score for other-sport experience that was 1.7 SDs above the sample mean. Apparently, these students were unable to acquire enough relevant information from the

demonstration to form a clear cognitive representation of the jazz dance. Its particular complexity of both sequencing and movement components may have been the cause. Task complexity has been shown to be a key factor affecting observational learning (Downey, 1988; Gould, 1978; Sheffield, 1961).

(3) One student scored in the lowest group for CR for both dances, CRF = 12, CRJ = 7. Although this may indicate a deficiency in forming the cognitive representation, the subject's PA scores were both above the mean, PAF = 512 and PAJ = 353, suggesting that more learning had occurred than had been measured by the photo-resequencing task. In addition, three of the other low-scoring students ranked considerably higher within the total sample ($\underline{N}$ = 29) on the resequencing task (CR score) for the second dance they observed than for the first. Learning to perform the resequencing task may have been a factor influencing the cognitive representation scores, as was suggested in an earlier study (Chapter 2). Other suggested explanations for performance reproduction scores that seem to reveal more "learning" than measured by the CR scores included (a) differing motivational levels for the photo-resequencing and dancing tasks and (b) the possibility of a "kinesthetic" cognitive representation (Chapter 2).

(4) No apparent patterns were found within the dance skill and experience variables to describe the responses of the remaining low-scoring subjects. Inconsistency in performance, which is characteristic of novices, may account for some of

the findings. Furthermore, individual differences in variables not addressed in this study may have been responsible.

Summary. An inspection of the dance skill and experience variables for individuals scoring at the extremes of the continua for the measures of the cognitive representation and performance accuracy was made. Findings confirm that domain expertise is a key factor in the ability to learn from a demonstration. Related and other-sport experiences may also be important in some cases; coaching and teaching involvement in these areas seems to be a contributor to their influence. Low scorers seemed to be affected by task complexity, the novelty of the resequencing task, and the performance inconsistency that is typical of novice learners.

Results and Discussion--Part II

In addition to understanding the effects of entry-level characteristics of their students on initial performance, teachers often wish to consider changes in performance that occur over a period of instruction. Knowledge of these changes is important for evaluating student progress and the teaching/learning process. The second part of the study focused on changes in observational learning abilities that occurred during the folk dance course. Posttest data, collected after nine weeks of the course, were analyzed (a) to determine correlates of change in observational learning ability and (b) to identify individual students who exhibited exceptional change.

Dance Skill and Other Motor Performance Experience as Predictors of Change in Observational Learning Ability

The first concern was to determine if change in the students' ability to learn from a demonstration had occurred during the folk dance course. Then initial dance skill and prior motor skill experiences were reconsidered as predictors of observational learning to determine if their influence had changed.

Comparison of pretest and posttest observational learning scores. The initial analysis employed a one-sample, paired t test on the CR, PA, and PQ scores for each dance. For the folk dance, mean posttest scores for all dependent variables (CRF = 27, PAF = 511, PQF = 6.7) were higher than on the pretest (CRF = 21, PAF = 439, PQF = 6.6). The difference was significant for cognitive representation (CRF $t = 4.04$, $p < .001$) and performance accuracy (PAF $t = 5.88$, $p < .001$) but not for performance quality (PQF $t = 0.27$, $p > .05$). Similarly, for the jazz dance, mean posttest scores were significantly higher than pretest scores for cognitive representation (CRJ = 26 and 15, $t = 6.91$, $p < .001$) and performance accuracy (PAJ = 411 and 307, $t = 7.33$, $p < .001$) but not for performance quality (PQJ = 6.8 and 6.8, $t = 0.08$, $p > .05$). Apparently, these students acquired more information from the dance demonstrations and were able to produce the dances physically with more accuracy after the folk dance course. However, performance quality after the course was similar to what it was before the course. Table 4.5 illustrates the results.

TABLE 4.5

One-Sample Paired T Tests for Pretest/Posttest Scores of Response Acquisition (CR) and Performance Reproduction (PA, PQ) for Folk and Jazz Dances

Variable	M	SD	t	df	α	Δ
Folk						
CR1	21.24	7.07	-4.04	28	.001	.55
CR2	27.00	7.65				
PA1	439.26	85.72	-5.88	28	.001	.56
PA2	510.53	94.35				
PQ1	6.62	3.23	-0.27	28	.789	
PQ2	6.72	3.57				
Jazz						
CR1	14.83	4.96	-6.91	28	.001	.98
CR2	25.93	10.21				
PA1	306.66	108.14	-7.33	28	.001	.69
PA2	411.26	105.61				
PQ1	6.76	3.09	-0.08	28	.937	
PQ2	6.79	2.61				

Note. Variable numbers: 1 = pretest (before course)
2 = posttest (after course)

Maximum possible scores:
Folk dance CR = 51, PA = 743, PQ = 30.
Jazz dance CR = 59, PA = 767, PQ = 30.

Δ = effect size = M_2-M_1/SD_w (Glass & Hopkins, 1984)

Cause-and-effect can not be stated equivocally, but the behavior and comments of the subjects during and following pretests and posttests strongly suggest that the course had influenced their performances. Strategies and skills used frequently in the second testing, but not in the first, reflected principles taught in the course. With the exception of the two most experienced and the two who showed the least gains in posttest scores, all subjects stated that they used different learning and/or observation strategies and were aware of different things in the demonstrations during the posttest. Both verbal and dance-movement vocabularies appeared to have been enhanced for many students, perhaps allowing them to recognize, label, and perform actions more easily. More subjects seemed to be able to assess their performances accurately, recognizing sources of difficulties. Self-confidence seemed greater; an assertive approach to the modeling task was much more evident in the posttest. Perceived self-efficacy may have improved as a result of the dance course (Bandura, 1989). If so, level and persistence of student efforts may have been affected, although most students appeared to try hard during both testings. In addition, experience with the modeling tasks, which were novel to all subjects in the pretest, probably contributed to improved performances on the posttest. Both print-resequencing and physical performances were likely enhanced by these changes.

Results of regression analyses to determine correlates of change. Because the subjects' ability to learn and perform the demonstrated dance sequences improved on the average, the effects of initial skill level in dance and prior motor skill experiences on the process were reconsidered. Hierarchical regression was again employed, this time entering the pretest observational learning score into the appropriate equation as the first independent variable to control for any effects of these scores on the dependent variables.

All pretest scores were positively related to the corresponding posttest scores. For the folk dance, CR $r = .46$, $p < .01$; PA $r = .74$, $p < .001$; and PQ $r = .82$, $p < .001$. Similarly, for the jazz dance, CR $r = .53$, $p < .01$; PA $r = .74$, $p < .001$; and PQ $r = .68$, $p < .001$. Subjects tended to perform similarly, relative to the rest of the sample, on the pretest and the posttest for all measures of observational learning (CR, PA, PQ). In particular, performance reproduction scores (PA and PQ), tended to change very little relative to others in the group.

On the posttest, dance skill was positively correlated with folk dance performance accuracy, $r = .49$, $p < .01$, and performance quality, $r = .43$, $p < .05$. Dance experience was also significantly related to folk dance performance quality, $r = .45$, $p < .01$. In addition, there was a significant inverse relationship between experience in other sports and folk dance performance quality, $r = -.40$, $p < .05$. For the jazz dance, none of the dance skill and experience variables was significantly related to posttest observational learning scores. However, the relationship between performance accuracy and both dance skill, *r* = .33, and dance experience, *r* = .33, approached significance, $p < .10$. Table 4.6 shows the bivariate correlations between the posttest scores for response acquisition (CR) and performance reproduction (PA, PQ) and the pretest scores, dance skill scores, and the three experience variables for the folk and jazz dances.

TABLE 4.6

Bivariate Correlations Between Posttest Observational Learning Scores (CR, PA, PQ) and Pretest Scores, Dance Skill Scores, and Experience Variables for Folk and Jazz Dances

Posttest Score	Pretest CR	Pretest PA	Pretest PQ	Dance Skill	Experience Variables: Dance	Experience Variables: Related Sports	Experience Variables: Other Sports
Folk							
CR	.46**			.22	.12	-.31	-.16
PA		.74***		.49**	.30	.21	-.26
PQ			.82***	.43*	.45**	-.07	-.40*
Jazz							
CR	.53**			.20	.12	.12	.12
PA		.74***		.33[a]	.33[a]	.03	-.06
PQ			.68***	.07	.03	-.14	-.29

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

[a] $p < .10$.

(Two-tailed tests for all correlations)

The next goal was to "identify the characteristics that predispose individuals to show improvement" (Schutz, 1989, p. 221). Tables 4.7 and 4.8 summarize the regression analyses of the measures of observational learning (CR, PA, PQ) on entry-level dance skill and the three experience variables for the folk and jazz dance posttests, respectively. Pretest scores were entered into the equations first in each case to control for any influence of the initial learning and performance scores (Schutz, 1989).

For the folk dance, after all IVs had been entered into the equation, R was significantly different from zero for all measures of observational learning (CR: $R = .60$, $p < .05$; PA: $R = .76$, $p < .01$; PQ: $R = .84$, $p < .001$). Pretest CR scores accounted for 21% of the variance in the posttest CR scores, $R = .46$, $F_{inc}(1,27) = 7.24$, $p < .05$. Additions of dance skill in the second step of the analysis ($F_{inc}[1,27] = 0.06$) and dance experience in the third step ($F_{inc}[1,27] = 0.09$) did not result in significant increments in R^2. However, addition of related experience to the equation in the fourth step did produce a significant increment in R^2 for the cognitive representation scores (R^2 change = .14) even after differences in pretest scores, dance skill, and dance experience had been accounted for: $R^2 = .36$, $F_{inc}[1,27] = 5.38$, $p < .05$. After the final step, at which other experience was added to the prediction of CR by the four higher priority IVs, $R^2 = .36$, $F_{inc}(1,27) = 0.27$. Addition of other experience did not contribute significantly to prediction of CR for folk dance at its point of entry into the equation.

Performance accuracy scores in the folk dance pretest accounted for 55% of the variance in PA scores in the posttest, $\underline{R} = .74$, $\underline{F}_{inc}(1,27) = 32.83$, $\underline{p} < .001$. Additions of dance skill in the second step of the analysis, $\underline{F}_{inc}(1,27) = 0.00$, dance experience in the third step, $\underline{F}_{inc}(1,27) = 0.18$, related experience in the fourth step, $\underline{F}_{inc}(1,27) = 0.02$, and other experience in the final step, $\underline{F}_{inc}(1,27) = 1.45$, did not result in significant increments in $\underline{R}^2$. That is, dance skill and the three experience variables did not contribute significantly to the prediction of PA for the folk dance after differences in pretest scores had been statistically accounted for. When all IVs had been entered into the equation, $\underline{R}^2 = .58$, adjusted $\underline{R}^2 = .49$.

Pretest PQ scores for the folk dance accounted for 67% of the variance in posttest PQ scores, $\underline{R} = .82$, $\underline{F}_{inc}(1,27) = 55.79$, $\underline{p} < .001$. The addition of dance skill ($\underline{F}_{inc}[1,27] = 0.24$) and the three experience variables, in order (dance experience $\underline{F}_{inc}[1,27] = 0.13$, related experience $\underline{F}_{inc}[1,27] = 0.45$, other experience $\underline{F}_{inc}[1,27] = 1.06$) did not reliably improve the prediction of PQ after differences in pretest scores had been statistically eliminated. When all IVs were included in the equation, $\underline{R}^2 = .70$, adjusted $\underline{R}^2 = .63$.

TABLE 4.7

Hierarchical Regression of Posttest Observational Learning Scores (CR, PA, PQ) on Pretest Scores, Dance Skill, and Experience Variables for the Folk Dance

DV	Variables	B	β	sr^2	R^2	AdjR^2	R
CRF2	CRF1	0.554	0.51	.21*		.18	
	Skill	0.015	0.06	.00			
	Dance	-0.302	-0.08	.00			
	Related	-1.392	-0.37	.14*		.25	
	Other	-0.323	-0.09	.01	.36	.23	.60*
	Intercept =	33.429					
PAF2	PAF1	0.805	0.73	.55***		.53	
	Skill	-0.216	-0.07	.00			
	Dance	2.116	0.04	.00			
	Related	2.088	0.04	.00			
	Other	-7.520	-0.17	.03	.58	.49	.76**
	Intercept =	218.412					
PQF2	PQF1	0.817	0.74	.67***		.66	
	Skill	0.004	0.03	.00			
	Dance	0.083	0.05	.00			
	Related	-0.102	-0.06	.01			
	Other	-0.209	-0.13	.01	.70	.63	.84***
	Intercept =	3.072					

Note. Variable numbers: 1 = pretest (before course)
2 = posttest (after course)

* $p < .05$. ** $p < .01$. *** $p < .001$.

sr^2 = squared semipartial correlation

In summary, the variable that contributed most to the prediction of the cognitive representation, performance accuracy, and performance quality scores for the folk dance posttest was the corresponding pretest score, entered first into the equation in each case. The entry-level dance skill and motor skill experience variables made very little contribution to the prediction of posttest observational learning scores beyond what they had already contributed to the pretest scores. With the exception of the effect of related-sport experience on the cognitive representation scores, the initial skill and experience variables did not contribute to change in observational learning ability for these beginner dancers.

Results indicate that for the jazz dance (Table 4.8), as for the folk dance, pretest scores made the main contribution to prediction of each of the posttest observational learning scores. For every DV, $\underline{R}$ was significant after all independent variables had been entered into the equation (cognitive representation, $\underline{R} = .63$, $\underline{p} < .05$; performance accuracy, $\underline{R} = .78$, $\underline{p} < .001$; performance quality, $\underline{R} = .69$, $\underline{p} < .01$).

For cognitive representation, the significant relationship between the pretest and posttest scores accounted for 28% of the variance, $\underline{F}_{inc}(1,27) = 10.76$, $\underline{p} < .01$. None of the dance skill and experience variables made a significant contribution to predicting CR on the posttest of the jazz dance at its point of entry into the equation (dance skill, $R^2 = .29$, $F_{inc}[1,27] = 0.35$; dance experience, $R^2 = .30$, $F_{inc}[1,27] = 0.38$; related experience, $R^2 = .31$, $F_{inc}[1,27] = 0.13$; and other experience, $R^2 = .40$, $F_{inc}[1,27] = 3.30$; $p > .05$ in all cases).

Similarly, pretest PA scores for the jazz dance accounted for 55% of the variance of the posttest PA scores, $F_{inc}(1,27) = 33.00$, $p < .001$. Dance skill ($R^2 = .55$, $F_{inc}[1,27] = 0.02$) and previous motor skill experience (dance $R^2 = .56$, $F_{inc}[1,27] = 0.46$; related $R^2 = .58$, $F_{inc}[1,27] = 0.95$; and other $R^2 = .61$, $F_{inc}[1,27] = 2.22$) did not make significant increments to the prediction of performance accuracy for the jazz dance once pretest scores on PA had been entered into the equation.

Finally, for the prediction of the jazz dance posttest PQ scores, 46% of the variance was accounted for by pretest PQ scores, $F_{inc}(1,27) = 22.67$, $p < .001$. The other independent variables did not contribute significantly to an increment in R^2 at their points of entry into the equation (dance skill, $R^2 = .46$, $F_{inc}[1,27] = 0.02$; dance experience, $R^2 = .46$, $F_{inc}[1,27] = 0.04$; related experience, $R^2 = .47$, $F_{inc}[1,27] = 0.70$; and other experience, $R^2 = .48$, $F_{inc}[1,27] = 0.15$).

These findings are virtually the same as for the folk dance. Dance skill and varied motor skill experiences assessed prior to the dance course did not correlate with changes in the observational learning ability of these beginner dancers beyond what they had already contributed to pretest scores.

TABLE 4.8

Hierarchical Regression of Posttest Observational Learning Scores (CR, PA, PQ) on Pretest Scores, Dance Skill, and Experience Variables for the Jazz Dance

DV	Variables	B	β	sr^2	R^2	Adj R^2	R
CRJ2	CRJ1	1.217	0.59	.28**		.26	
	Skill	0.044	0.12	.01			
	Dance	0.788	0.15	.01			
	Related	0.035	0.01	.00			
	Other	1.501	0.32	.09	.40	.26	.63*
	Intercept =	-20.913					
PAJ2	PAJ1	0.778	0.79	.55***		.53	
	Skill	0.128	0.03	.00			
	Dance	5.848	0.11	.01			
	Related	-8.978	-0.17	.02			
	Other	10.158	0.21	.04	.61	.53	.78***
	Intercept =	88.816					
PQJ2	PQJ1	0.550	0.65	.46***		.44	
	Skill	0.003	0.03	.00			
	Dance	-0.049	-0.04	.00			
	Related	-0.147	-0.11	.02			
	Other	-0.079	-0.07	.00	.48	.36	.69**
	Intercept =	5.457					

Note. Variable numbers: 1 = pretest (before course)
2 = posttest (after course)

* $p < .05$. ** $p < .01$. *** $p < .001$.

sr^2 = squared semipartial correlation

Summary. There seemed to be potential for the initial dance skill and experience variables to contribute to the prediction of observational learning ability measured after the dance course. However, the effects of these predictors were completely subsumed by the strong relationship between the pretest and posttest scores on the modeling measures (CR, PA, PQ). Although subjects generally tended to have better response acquisition and performance reproduction scores on the posttest, the best predictor of those scores was the subject's score on the corresponding pretest. The initial dance skill and experience variables were generally not able to add any further to the prediction of change in the ability to learn and perform dance following a demonstration of the dance.

Analyses of the Experience Profiles of Individuals Who Exhibited Exceptional Change in Observational Learning

It is frequently desirable to identify individuals for whom there have been either very large or very small changes in learning or performance during an instruction period. Such information may be used to assign evaluative progress marks or to enhance instruction. Characteristics of the individuals who exhibit exceptional change may suggest factors that influence students' abilities to succeed, thus enabling the instructor to design effective learning experiences. Therefore, this study considered the initial skill-and-experience characteristics of individuals who showed more or less improvement in observational learning ability than expected over the period of the dance course. Description of their profiles was expected to enhance understanding of potential factors contributing to success in the development of dance observational learning skills.

Subjects who showed exceptional change in response acquisition or performance reproduction between the pretests and posttests were identified by calculating residualized difference scores (Schutz, 1989). This score is a measure of the degree to which a subject improved more or less than would be expected, based on initial scores. The residualized difference score is the difference between the observed score and the predicted score, which is the posttest score with the pretest score partialled out. Field notes, basic dance skill scores, responses to the experience questionnaire (Appendix E), and responses to informal interviews following the posttest were used to describe cases at the extremes of the continuum of change.

<u>Overview of group changes and selection of individuals for analysis</u>. Similar to the earlier analysis of individual subjects in this report, cognitive representation scores (CRF and CRJ for folk and jazz dances, respectively) and performance accuracy scores (PAF and PAJ) were considered. Residualized difference scores indicated that 24 of the 29 subjects improved more than predicted, based on pretest

scores, on at least one of these four variables. Five scored higher than expected on all four measures, six on three of the measures, and nine on two of the measures. Of the latter, two improved their cognitive representation scores, four raised their performance accuracy scores, and one improved both folk dance scores beyond what was predicted.

Experience profiles of individual observers with greatest unexpected gains. For each dance, the five greatest residualized difference scores for cognitive representation (five each for CRF and CRJ) and performance accuracy (five each for PAF and PAJ) were noted, and the students who had acquired those scores were identified. A subject may have had one of the highest residualized difference scores on a single measure, on several measures, or on none of the measures. In fact, 14 students shared the 20 possible scores that represented greatest improvement beyond what was expected on a single variable (CRF_{gain}, CRJ_{gain}, PAF_{gain}, PAJ_{gain}). No one subject qualified for greatest improvement in all four categories.

(1) One subject showed greatest gain beyond what was expected for three variables, $CRF_{gain} = 10$, $PAF_{gain} = 117$, $CRJ_{gain} = 16$. He also had a higher score than predicted on the fourth, $PAJ_{gain} = 9$. Pretest scores were in the middle third of the sample (N = 29) for all four DVs. His basic dance skill score and experience scores were all within one SD of the mean. His behavior during the posttest included making

quick judgements about the prints, immediately noting (for the first time) the jazz repetition, showing awareness of musical cues, recognizing places where he needed to pay strict attention to the demonstration, and attending to small details in the photos. Apparently, this subject employed a variety of learning strategies permitting him to address each modeling task effectively. Furthermore, his pretest scores suggest that he may have been at a sufficient level of learning readiness, based on a developing knowledge base in observational and dance skills, to acquire the modeling skills to which he was exposed in the course.

(2) All four subjects showing greatest unexpected gain on two of the observational learning measures improved both CR and PA in the same dance--two subjects for folk dance (CRF_{gain} = 17 and PAF_{gain} = 77; CRF_{gain} = 10 and PAF_{gain} = 109) and two subjects for jazz dance (CRJ_{gain} = 12 and PAJ_{gain} = 112; and CRJ_{gain} = 13 and PAJ_{gain} = 78). This finding supports the premise that the two phases of Bandura's theory are importantly linked. Improvement in the cognitive representation is expected to enhance performance reproduction, at least to the extent that the observer is able to replicate the actions physically. These subjects all had average dance skill scores, enabling them to produce component actions as needed.

Three of these four students scored in the middle third of the sample on these same variables in the pretest. This finding is similar to that of the subject above and may reflect a readiness for learning as well as the fact that there was room in the scoring system for improvement. Only one of the four exhibited an exceptional prior-experience score: 3.8 SDs above the mean for other sports. This resulted from many years of coaching swimming and may have played a role in her success.

(3) Of the nine remaining subjects who showed unusual gain, one was experienced in dance, 2.5 SDs above the dance-experience mean. She scored highly compared to the rest of the sample on the pretest as well. Three subjects might reflect regression to the mean, having scored in the lowest group for the corresponding measure on the pretest. The final five may simply reflect the inconsistent performance of beginners because no specific causes for their behavior were obvious from the dance skill and experience data.

Experience profiles of individual observers with least gains. For both dances, students who improved less than expected, based on pretest scores, were also considered. The five lowest residualized difference scores for CR and PA were found, and the subjects who had achieved these scores were identified. As before, a subject might have exhibited a least-gain score on a single dependent variable or on several (CRF, PAF, CRJ, PAJ). Thirteen persons shared the 20 possible least-gain positions for CR and PA in the two dances. Four of these might reflect regression to the mean, having scored very highly on the pretest for the same single variable. Four others may have been in this group as a result of typical novice-learner responses. The remaining five are described below.

(1) One subject was in the least-gain group for all four variables ($CRF_{gain} = -7$, $PAF_{gain} = -100$, $CRJ_{gain} = -9$, $PAJ_{gain} = -100$). She had a basic dance skill score of 166, 1.2 SDs above the mean, and experience scores within one SD of the mean in all cases. Her approach to the task and the learning strategies employed seemed to be the cause of her low scores. This subject did not alter her procedures in any way from the pretest: observing only a small portion of the demonstration (as much as she thought she could remember), turning away from the video-monitor at that time, dancing only when called upon to perform, and adding on bits of information in sequence with each viewing. This process had allowed her to be amongst the highest for PA on the folk dance in the pretest, but the method did not permit her to improve her scores as other students did. She was at a particular disadvantage for the jazz dance because she never watched the demonstration long enough to observe the repetition of the pattern. For both dances, the cognitive representation was probably incomplete, and performance reproduction also suffered because of it.

(2) Four subjects were in the least-gain group on two variables. One apparently had difficulty with the resequencing task, scoring poorly on both cognitive

representation measures (CRF_{gain} = -9, CRJ_{gain} = -12). Another scored poorly on both PA scores (PAF_{gain} = -67, PAJ_{gain} = -71), indicating physical performance problems. These two students were in the middle third of the sample, thus seeming quite average, on the corresponding performance and cognition scores. The first student seemed to have grasped more of the demonstrated material than could be recognized in the prints. The second apparently learned more than could be reproduced physically. These results illustrate the need for careful assessment of student learning and performance difficulties in order to interpret observational learning problems with accuracy.

The other two subjects who were in the least-gain group for two of the considered dependent variables were generally low scorers, although one showed improvement beyond what was expected on the other two variables.

Summary. The inspection of individual experiential backgrounds and their potential connection to exceptionally high or low improvement in observational learning over the dance course, again supported the proposed interrelatedness of the two phases of Bandura's theory. Readiness for learning seemed to be a key variable contributing to greater improvement than expected in dance observational learning; a fundamental knowledge and skill level probably facilitates the development of domain-specific modeling skills. Poor application of learning strategies and specific difficulties with either the resequencing task or the physical replication of the movements were factors that appeared to contribute to particularly poor change scores for these beginner dancers. The inconsistency of performance typical of the early stages of learning was also apparent (Fitts & Posner, 1967).

Conclusions

The purpose of this study was to investigate movement-experience factors that might influence the success of beginner dancers in a learning situation involving dance demonstrations. The first question considered the potential of predicting initial observational learning success from entry-level dance skills and varied motor skill experience. A second concern was the description of experiential factors that might influence change in a student's ability to learn dance from demonstrations. Both group and individual data were assessed in the process of detailing variances in observational learning ability.

Can dance skill and varied prior motor skill experiences predict initial success in dance observational learning? Results of this study suggest that the answer is "only partially". The ability to perform basic sequential, rhythmic dance movements was found to be the best predictor of both response acquisition and performance reproduction by beginner dancers for a highly structured, repetitive folk dance sequence. For a more loosely structured jazz dance, this dance skill ability contributed to the prediction of accurate physical performance. Experience measures reflecting the amount of time involved in dance, sports similar to dance, and other types of sports, had virtually no influence on prediction of the modeling measures in this study. The findings generally support other research that contends that domain-specific knowledge is most important to success in skilled behavior (e.g., Thomas, French, & Humphries, 1986) and that physical skill in an activity may be particularly critical to observation of the skill (Petrakis, 1987; Vickers, 1988). Even at these relatively low levels of dance expertise, greater domain-specific skills enhanced observational learning of dance.

In addition to the group data for these elementary dancers, the experience profiles of individuals at the extremes of the observational learning score continua showed this result, as expected. Beginners with better dance skills tended to perform better in initial experiences and maintain their superior positions when tested a second time. In contrast, students who were particularly deficient in dance expertise were clearly at a disadvantage, tending to have low scores on all measures of observational learning. In some individual cases, the modeling process in dance was also influenced by (a) experience in sports similar to dance, (b) high levels of other-sport experience especially involving or teaching/coaching experience, and (c) extensive, general motor skill experience. These varied experiences may have resulted in well-developed abstract schemas that facilitated performance of the novel dance tasks (Schmidt, 1975). Observational skills and/or cognitive strategies useful in motor skill acquisition situations may have been developed in addition to the physical skills required for performance of the dances. However, none of these related- and other-sport experiences were as effective as dance expertise itself in the prediction of dance observational learning success.

In spite of the results supporting domain-specific expertise as a predictor of observational learning ability, a large portion of population variance for each of the modeling measures used in this study was undefined by the skill and experience variables. Apparently, factors other than specific motor skill expertise played a major role in determination of observational learning success for these beginner dancers. These factors need to be identified if a consistently effective use of demonstrations is desired.

The findings of the first part of the study lend credence to the dance teacher's frequent use of audition classes for assessing entry-level abilities of new dance students. At this time, locomotor, rhythmic, and coordination skills related to the type of dance material to be learned seem to be the best indicators of initial success in learning from demonstrations of that material.

The second part of the study considered changes in observational learning ability during an elementary course in folk dance. The beginner dancers generally acquired more information from dance demonstrations and were able to replicate the sequences more accurately after participating in the course. Strategies and skills taught in the course seemed to be being utilized.

The best predictor of posttest learning and performance was the dancer's score on the corresponding pretest observational learning measure. The learners' entry-level dance skill and the experience characteristics were not helpful in predicting which beginner dancers would improve the most, beyond what was expected based on pretest scores, in observational learning ability during the dance course.

The analyses of individual subjects' posttest modeling scores again supported the proposed interrelatedness of the two phases of the observational learning process (Bandura, 1986). Beginner dancers who improved their response acquisition scores tended to improve their performance reproduction scores as well; those who had difficulty in the first phase frequently had difficulty during the second phase. Learning readiness at the beginning of the dance course appeared to be an important factor contributing to improvement in the ability to learn from dance demonstrations in this investigation. Finally, individuals who exhibited the least improvement in their observational learning abilities during the folk dance course were apparently deficit in general learning strategies, in physical skills in the domain, or in the ability to address the print-resequencing task effectively.

In conclusion, further research is needed to add to our understanding of the influence of entry-level observer characteristics on initial motor skill modeling and on changes in observational learning abilities that occur with instruction. Future studies might include a larger sample with a wider range of experience in the various motor skill categories; in this study, experience in dance and related activities was particularly limited for most subjects. Additional types and complexities of ecologically valid movement sequences should be used to consider the interaction of experience characteristics with varied stimuli. Finally, other indicators of subject variability should be investigated. Suggested additional observer characteristics that might be considered include grade point average, because early learning is thought to be highly cognitive (Fitts & Posner, 1967; Gentile, 1972); preferred learning style, which may be an important factor in motor skill acquisition (Buell, Pettigrew, & Langendorfer, 1987); and observational strategies, which have been shown to be individual specific for dance teachers observing dance (Petrakis, 1987) and may also relate to physical skill level in the skill being observed (Vickers, 1988).

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CHAPTER 5

GENERAL SUMMARY OF CONCLUSIONS AND IMPLICATIONS OF THE RESEARCH

GENERAL SUMMARY OF CONCLUSIONS AND IMPLICATIONS OF THE RESEARCH

This research project was founded on a desire to enhance understanding of the observational learning process which is an important component of many motor skill acquisition situations. Concern about the frequent ineffective use of demonstrations, at least partially due to instructors' lack of knowledge about the modeling process, led to questions focusing on, first of all, the composition of the modeling process itself and, secondly, on the relationship between observer expertise and the components of that process. Bandura's social cognitive theory (1986) provided the theoretical base for investigating observational learning. Research on domain-expertise, particularly in sport activities, was the foundation for considering the effects of experience on this teaching technique.

This chapter summarizes the conclusions. Implications of the research findings, both theoretical and practical, are suggested.

Independent Measures of Learning and Performance

The first goal was to develop independent measures of learning (response acquisition) and performance (performance reproduction) following the observation of an ecologically valid movement task. Assessment of each of these phases of observational learning is necessary if a clearer understanding of the complexities of the modeling process is to be achieved. Use of a realistic motor skill activity was desired to facilitate application of the findings of the research to actual instructional settings.

The Task

The movement activity selected was dance suitable for university-aged young adults. Two sequences (consisting of 62 and 64 identifiable foot actions, each performed to 16 measures of appropriate music lasting about 30 seconds) were created. They were designed to present variations in (a) dance form and style, (b) step patterns, (c) movement difficulty, and (d) sequence characteristics so that a meaningful range of learning and performance scores might appear. The folk dance was based on a traditional Scottish dance; the jazz sequence was choreographed by the experimenter. The inherent organization of the folk dance pattern, the repetitiveness of its steps, and its simple arm movements and use of space caused it to be less complex than the jazz dance. The latter required a more global appraisal to identify the sequential patterning. In addition, its spatial characteristics and limb and torso involvement in the movements contributed to its greater complexity.

The Assessment of Learning and Performance

Learning. The instrument designed to measure response acquisition, or learning, was an adaptation of Carroll and Bandura's (1982) pictorial-resequencing task. After observing a demonstration, subjects arranged a scrambled set of still photos of the actions in the sequence into the order in which they had appeared in the demonstration. For this study, the photo-resequencing task was repeated five times during the acquisition period for each dance, interspersed with physical practices and additional demonstrations. Due to the length of the sequences, approximately 60 photos were required to effectively represent the movements of each dance. Hence, consecutive photos were mounted together in pairs to reduce the amount of information processing required, and subjects arranged print-pairs to represent each sequence. In addition, the subject's arrangement of the prints was left in place after each trial so that extension and refinement of the pictorial representation continued throughout the procedure. Accuracy of the print arrangement, based on the positioning and sequencing of the prints within the overall pattern, was defined to be a measure of the accuracy of the cognitive representation reflecting the learning that had occurred.

Performance. During the acquisition period, subjects had ten opportunities to perform each dance with accompanying music. These physical practices were interspersed with repeated observations of the demonstration and attempts at resequencing the still prints. Videotaped recordings of the two final dance performances were evaluated for accuracy and quality.

Performance accuracy scores were based on detailed descriptions of each of the individual movements of the dance: inclusion of each action, sequencing of the action, production of the action in relation to the music, and precision of all body-part and spatial characteristics of the action. Performance quality scores were based on the subjective assessments of three expert judges. Accuracy and quality were considered to be two complementary components of performance reproduction, the second phase of the modeling process.

Analysis of the Measurement Instruments

The appropriateness of the measurement instruments was investigated using university students of two levels of dance expertise. The findings suggest that the print-resequencing procedure, the performance accuracy measure, and the subjective assessment of performance quality are all appropriate for their specific tasks. Dancers with more experience scored higher than the less-experienced students on all measures, and internal consistency of the measures and interrater objectivity were generally acceptable. Scores for all measures of observational learning were generally lower for the jazz dance than for the less complex folk dance. Under the conditions of this study, the print-resequencing task seems to be successful at assessing response acquisition independently of the overt performance. The two measures of performance reproduction appear to assess interrelated aspects of the modeling process, as desired.

Additional considerations suggested by the findings include the following:

1. Scores from the resequencing task seem to reflect two aspects of the cognitive representation: (a) the amount of information actually perceived and recalled from the demonstration, and (b) the information the subject is able to extract from the still prints.

2. The moderate positive correlations among the response acquisition and performance reproduction scores support Bandura's claim that the two phases are interrelated. However, the moderate degree of the relationships reinforces the belief that skilled physical performance involves more than simply the cognitive understanding of what to do. Obviously, additional skills are required to link the cognitive representation successfully with the motor system.

3. Performance accuracy scores, higher on a percentage basis than corresponding response acquisition scores, suggest that the resequencing task may not assess all the learning that occurs. Potential explanations for this finding include novelty of the resequencing task, time constraints of the protocol, alternative views of the modeling process, or the possibility of a kinesthetic internal representation in

addition to the verbal and visual representations generally considered.

Effects of Observer's Experience and Skill Level on Learning and Performance in Motor Skill Modeling

The second goal of this research was to investigate the role of observer expertise on the two phases of the observational learning process. Domain-specific expertise--in this case, dance expertise--and general movement expertise were both of interest because instructors using demonstrations frequently encounter students with widely varied movement backgrounds.

General Procedures

University dance majors were the highly skilled expert dancers in the research. The beginner dancers were university physical education majors with limited dance experience but considerable amounts of experience in other types of motor skills. The folk and jazz dance sequences previously described represented the content to be learned from videotaped demonstrations. Response acquisition and performance reproduction were measured via the pictorial-resequencing task and visual analyses of videotaped dance performances, respectively.

Conclusions

Based on quantitative and qualitative (field notes, verbal reports, etc.) findings and within the confines and limitations of this study, the following were shown:

1. Expert-novice differences in dance affect both phases of the observational learning process. Experts consistently recall more of the demonstrated content, representing it more accurately in both the resequencing task, which assesses learning, and in the overt performance than do novice dancers.

2. Experts use more strategies (verbal labeling, grouping, musical cues, rehearsal) than novices to help them learn and perform demonstrated dances.

3. Experts tend to approach the observational learning task from a global perspective, gathering general information about the dance pattern and identifying units of total body movements. In contrast, novices are inclined to follow a chronological method of observing from the beginning and adding on bits of information in order.

4. Experts are not distracted by isolated actions or changes in spatial elements of the dance, whereas novices often are.

5. Experts are better than novices at all aspects of the physical performance: including relevant actions, sequencing them, relating them to the music, incorporating total body actions and accurate spatial changes, and performing with the style characteristics of the particular dance.

6. Experts are less affected by the structure differences between dance styles than are beginner dancers. Experts seem to be able to generate spontaneous strategies to enhance recall of less obvious and more complex dance patterns.

7. Gender has no significant effect on either phase of the modeling process in dance when differences due to domain-specific experience are included in the analysis.

8. Even within a group of beginner dancers, domain-specific expertise--specifically dance skill level rather than amount of experience--is the best indicator of success in a dance observational learning situation. This finding supports the dance teacher's frequent use of auditions to determine the appropriate instructional level for new students.

9. Performance quality in beginner dancers reflects different things: Generally, quality improves with performance accuracy. Students must understand what they are to do and be able to produce the fundamental movement pattern before aesthetic elements of the performance can develop. On the other hand, an inherent, dance-like movement quality may accompany even inaccurate or uncertain performances by some individuals.

10. Nondomain movement experience influences the modeling process in dance in some individual cases. In particular, experience in sports similar to dance (e.g., gymnastics) and extensive experience in a variety of sport activities have

been shown to positively affect dance observational learning. Teaching or coaching involvement in sports other than dance may also enhance learning from dance demonstrations. Apparently, skills developed in these other motor skill situations may be transferable to the modeling process in dance.

11. Beginner dancers are able to develop new strategies in an elementary dance course and improve their observational learning ability. Students who have a repertoire of learning strategies to apply to novel experiences do better than those who rely on fewer strategies.

12. There may be an optimal degree of learning readiness, or a fundamental knowledge base, necessary for the most efficient development of observation and dance skills.

Delimitations and Limitations of the Research

When considering the results and conclusions of this research, the following should be kept in mind:

Delimitations. Delimitating conditions of this project include:

1. A total sample of 40 students from two English universities served as subjects.

2. The average age of the subjects was 22.5 years.

3. The experts were university dance students with an average of 11.1 years of dance experience, including at least

three years of daily training in classical ballet and modern dance.

4. The beginner dancers were university physical education majors with minimal dance experience.

5. The expert group consisted of one male and nine females.

6. The two sequences used in the research represent only a small selection of the footwork, movement patterns, style, and complexity variables possible in dance.

7. The methods used to measure response acquisition, performance reproduction, basic dance skill level, and movement experience are only one way, in each case, for assessing these variables.

Limitations. The following were limitations of the study:

1. Due to the length of each testing session, there may have been a decline in motivation as a result of fatique, boredom, or frustration, possibly affecting measures of both response acquisition and performance reproduction.

2. Self-consciousness related to dancing in front of the experimenter, the cameraman, and the camera may have affected some students' performance reproduction scores.

3. The novelty of the tasks may have affected scores for both phases of the modeling process.

4. The design of the acquisition trials may not have been arranged to meet the individual learning styles of some

subjects, thereby influencing their learning and performance scores.

Implications of the Research

Theoretical Perspectives and Future Investigations

The cognitive and the motor performance aspects of the observational learning process (Bandura, 1986) can be assessed independently, not only for short sequences of actions but also for relatively long sequences that more closely resemble those of dance, gymnastics, and figure skating routines. Hence, in future studies of motor skill modeling, both phases of the process can and should be considered. The effects of task, model, and observer characteristics on the process would be more clearly understood, and the relationship between the cognitive and physical performance elements of motor skills might be clarified. Continued refinement of the techniques used in this research is recommended as well as the development of other methods of assessing response acquisition (e.g., analysis of concurrent verbalizations during the resequencing task) and performance reproduction. Alternative research designs using the measurement tools of this project (e.g., unlimited time to perform the resequencing task) would add to our understanding of the information generated by these techniques.

Motivation has been discussed primarily in terms of its effect on the overt performance of the movement skill.

However, when a "performance" task such as pictorial-resequencing is employed in the research, motivation levels of the subjects must also be considered for their effects on the measures of response acquisition. Subjects may vary in their desire to successfully arrange the pictures just as they may approach production of the movement skill with varying degrees of incentive. This possiblity should be recalled when interpreting the assessments of the two phases of the modeling process and the relationship between them.

The observed discrepancy between the response acquisition and performance accuracy scores in this study deserves further attention. Can the differences be attributed solely to motivation and to physical skills? Is Sculley and Newell's (1985) hypothesis more relevant than Bandura's social cognitive theory (1986) for motor skill behavior? Does there exist a kinesthetic representation which complements the visual and verbal representations in memory? Are Sculley and Newell's theory and the kinesthetic proposal one and the same? Obviously, further research is warranted.

During the acquisition period in this research design, response acquisition scores generally improved, following fairly typical "learning" curves. No attempt has been made to analyze the dance performance scores over the same period. Hence, questions still remain: Do the two phases of observational learning develop similarly? What differences are there between expert and novice dancers in the development of the cognitive representation and the physical replication? Very specific differences between the responses of the experts and novices might be determined through a detailed qualitative analysis of the progression of (a) the print arrangements and (b) the inclusion and accuracy of the performance elements. In future studies, supplementing this information with an analysis of verbalizations produced concurrently with the resequencing task could also be enlightening.

Better methods of evaluating past motor skill experience are needed. Refinement of the questionnaire used in this study may be possible; in particular, a more precise scoring system is desirable. Some way to assess the quality of the involvement would also be of great benefit. Similarly, if entry-level dance performance is the most effective predictor of success in the dance class, the further development of screening procedures using appropriate dance skills would be very valuable, particularly if these methods are then made available to dance instructors.

Expertise in dance affects the observational learning of dance. Hence, researchers concerned with dance and the modeling process must carefully consider the dance skill level of the subjects involved in any future investigations. Furthermore, an effort should be made to determine what other entry-level characteristics of the subjects might affect the modeling process. Academic performance, perhaps distinguishing between achievement in theoretical and practical/applied studies; preferred learning styles; observational skills; and imagery ability are possible considerations.

Potential extensions of this research include similar studies focusing on (a) subjects from different populations, for example, students with different academic and movement-experience backgrounds or other age groups, (b) varied dance sequences, and (c) other motor skill activities. Expansion of the design to include other components of a realistic demonstration situation, for example, verbal cues and/or performance feedback supplied by the experimenter, mirrors, or videotape, would enhance our understanding of skill acquisition in real-life settings. A comparison of the abilities of students who have been specifically instructed in learning and/or observational strategies and other learners in content courses that did not emphasize these strategies might provide insight into the teaching methodologies that would be most effective in improving modeling skills.

Practical Implications of the Findings

Improvements in the use of demonstrations in dance classes may be possible as a result of this investigation. The study supports the belief that the modeling process is complex with cognitive, physical, and psychological elements potentially influencing successful observational learning. Teachers should be made aware of this complexity and helped to understand the unique yet interrelated aspects of the overall process. An appreciation of learner/observer involvement throughout the process should help teachers design better modeling experiences for their students.

Dance teachers must recognize the function of dance expertise in the observational learning process. Most would expect that skill level affects performance ability. However, many would not consider that expertise plays a major role in the ability to acquire, cognitively, the pertinent information conveyed by the demonstation. Understanding these important differences between beginner and experienced dancers in their responses to demonstrated dance material can lead to better dance instruction.

To enhance the ability to learn dance, the teaching of relevant observational learning skills can and should accompany the teaching of dance content. Students can be encouraged to view the demonstration initially from a global perspective to obtain an overall feeling for the sequence. Then they can be advised to focus their attention selectively on the foot actions, sequential patterning, body shape, spatial characteristics, etc., depending on the particular goal of the instructional situation. Teachers can facilitate retention of the relevant information by supplying verbal labels for actions or groups of actions, identifying groups of movements, and providing for mental and physical practice. However, rather than simply dispensing these aids to observational learning, teachers should inform the students about the strategies being used and why, involving them in the development of the techniques.

Instructors should also encourage physical skill development, progressively building the total movement sequence at a rate that suits the students' capabilities. The learners may require help in recognizing and responding to the basics of music before they are able to coordinate the movements with musical accompaniment. Characteristics of a dance's style may need to be explained with the demonstration and then practiced before the students can imitate them. Understanding how to acquire these aspects of the overt performance is not necessarily inherent. Beginner dancers may need guidance with these components of the observational learning process as well as with the response acquisition elements.

The experienced teacher's traditional use of audition classes to identify student dance skills and determine appropriate groupings of learners should continue. At the same time, teachers should be aware of other movement experiences of their students and build on that knowledge base as well. A fundamental knowledge base in observational and dance movement skills seems necessary for efficient acquisition of both physical and observation skills. Teachers need to be aware of this fact and not expect too much from beginner dancers. At the same time, they should not expect too little because the ability of beginner dancers to learn from dance demonstrations appears to be quite individually specific and seems to reflect other, as yet undetermined, sources of variation.

It is recognized that the results of this investigation may not generalize directly to physical activities other than dance. However, many of the findings seem to relate sufficiently to previous research conclusions to suggest that they may be applicable to other areas of motor activity. Instructors in sport situations other than dance, particularly those that seem similar to dance, should seriously consider possible implications of these findings for their own areas of interest.

Conclusion

There is little argument that demonstrations make an important contribution to many--perhaps most--motor skill acquisition situations. However, their effectiveness can be improved in many instances. It is hoped that the findings of this research will contribute to our knowledge about the observational learning process in ways that will equip dance and other movement educators to optimize the learning and performance resulting from their demonstration experiences.

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APPENDICES

APPENDIX A-1

Subject Consent Form -- Novices

January 1990

Dear Participant:

You have been asked to participate in a research project investigating the question: "How does prior motor skill experience affect the learning of dance from demonstrations?". This will require approximately two hours of time during the winter academic term. You will be asked to observe a videotape of two dance sequences, arrange still pictures of the dances you have seen, and perform the dances to the best of your ability. Scores obtained during the testing will be used only as group data and will have no effect on your evaluation in the Folk Dance course. All information will be confidential. Testing will be done individually and in private, you will be identified by number to assure anonymity, and you may withdraw from the study at any time, if desired. An alternative assignment of comparable value and time involvement will be provided if you do not desire to participate in the study.

Please sign the form below and return it to me as soon as possible. If you have any questions about the study, feel free to contact me at any time.

Your cooperation is greatly appreciated.

Peggy Downey
Dept. of Physical Education
McGill University
398-4189; Room 225

I agree to participate in the research project investigating learning from demonstrations.

______________ __________________________

Date Signature

APPENDIX A-2

Subject Consent Form -- Experts

March 1990

Dear Participant:

You have been asked to participate in a research project investigating the question: "How does prior motor skill experience affect the learning of dance from demonstrations?". This will require approximately one hour of time. You will be asked to observe a videotape of two dance sequences, arrange still pictures of the dances you have seen, and perform the dances to the best of your ability. Testing will be done individually and in private, you will be identified by number to assure anonymity, and you may withdraw from the study at any time, if desired. Scores obtained during the testing will be used only as group data, and all information will be confidential.

Please sign the form below and return it to me as soon as possible. If you have any questions about the study, feel free to contact me at any time.

Your cooperation is greatly appreciated.

Peggy Downey
Dept. of Physical Education
McGill University
398-4189; Room 225

I agree to participate in the research project investigating learning from demonstrations.

__________________ ________________________________

Date Signature

APPENDIX B-1

Description of Dance Sequences

Folk Dance:

Source: Jensen and Jenson, 1966, p. 98
Music: The Glasgow Highlanders (Strathspey), Jimmy Shand
Length: Sixteen measures, 26 seconds
Total Number of Photos: 52
Number of Prints (pairs of photos): 26
Camera: GE, HQ Movie Video System VHS, CG 9810
Videotape edited for testing:
Twelve repetitions of the demonstration
Ten seconds of blank tape between repetitions
Audiotape:
Fifteen repetitions of the music
Ten seconds of blank tape between repetitions
Foot patterns: Appendix B-2

Jazz Dance:

Source: Experimenter choreographed; classical jazz based on Giordano style
Music: Wandering Rose, Ramsey Lewis
Length: Sixteen measures, 31 seconds
Total Number of Photos: 60
Number of Prints (pairs of photos): 30
Camera: GE, HQ Movie Video System VHS, CG 9810
Videotape edited for testing:
Twelve repetitions of the demonstration
Ten seconds of blank tape between repetitions
Audiotape:
Fifteen repetitions of the music
Ten seconds of blank tape between repetitions
Foot patterns: Appendix B-3

APPENDIX B-2

Shepherd's Crook Folk Dance

Phrase 1:

Step R, step L, step R, develope L
Step L, step R, step L, develope R
Step R, step L, step R, develope L
Step L, step R, step L, develope R

Phrase 2:

Step R fwd, hop R, step L in place, hop L
Step R X bk L, step L to L, step R X frt L, hop R
Step L fwd, hop L, step R in place, hop R
Step L X bk R, step R to R, step L X frt R, hop L

Phrase 3:

Touch R to R ast hop L, touch R behind L ast hop L
Touch R to R ast hop L, touch R front of L ast hop L
Step R to R, draw L to R
Touch L to L ast hop R, touch L behind R ast hop R

Touch L to L ast hop R, touch L behind R ast hop R
Touch L to L ast hop R, touch L front of R ast hop R
Step L to L, draw R to L
Touch R to R ast hop L, touch R behind L ast hop L

Phrase 4:

Touch R to R ast hop L, touch R behind L ast hop L
Touch R front of L ast hop L, touch R behind L ast hop L
Step R X frt of L, rock bkwd onto L
Rock fwd onto R, rock bkwd onto L

Touch R to R ast hop L, touch R behind L ast hop L
Touch R front of L ast hop L, touch R behind L ast hop L
Step R to R, (hold one count)
Close L to R (hold)

Note. fwd = forward
X bk = cross in back of
X frt = cross in front of
ast = at the same time
bkwd = backward

APPENDIX B-3

Wandering Rose Jazz Dance

Phrase 1:

Step R, catch step L, step L bk, step R in place
Step L fwd, step R fwd, turn R on R, step L
Step R, kick L X frt R, step L, step R (turning R)
Step L, catch step R, step R fwd, kick L

Phrase 2:

Step L X frt R, back step R, back step L, back step R
Back step L, back step R, step L to L, step R to R
Step L X frt R, step R bk, step L to L, step R fwd
Pressup R, step L, pressup L, step R

Phrase 3:

Step L, catch step R, step R bk, step L in place
Step R fwd, step L fwd, turn L on L, step R
Step L, kick R X frt L, step R, step L (turning L)
Step R, catch step L, step L fwd, kick R

Phrase 4:

Step R X frt L, back step L, back step R, back step L
Back step R, back step L, step R to R, step L to L
Step R X frt L, step L bk, step R to R, step L fwd
Pressup L, step R, step L to L, touch R to L instep

Note. bk = back
fwd = forward
X frt = cross in front of
catch step, back step, and pressup are stylized jazz movements

APPENDIX C-1

Shepherd's Crook Performance Score Sheet

Subject ____ Testing ____ Performance ____ Date _______

Movement	P	S	Musicality			Precision							
			0	1	2	a	b	c	d	e	f	g	h
Step R													
Step L													
Step R													
Developpe L													
Step L													
Step R													
Step L													
Developpe R													
Step R													
Step L													
Step R													
Developpe L													
Step L													
Step R													
Step L													
Developpe R													
Step R fd													
Hop R													
Step L pl													
Hop L													
Step R Xbk													
Step L L													
Step R Xft													
Hop R													
Step L fd													
Hop L													
Step R pl													
Hop R													
Step L Xbk													
Step R R													
Step L Xft													
Hop L													

(con't.)

Movement	P	S	Musicality			Precision							
			0	1	2	a	b	c	d	e	f	g	h
Touch R R													
R bk L													
Touch R R													
R ft L													
Step R R													
Draw L-R													
Touch L L													
L bk R													
Touch L L													
L bk R													
Touch L L													
L ft R													
Step L L													
Draw R-L													
Touch R R													
R bk L													
Touch R R													
R bk L													
R ft L													
R bk L													
Step R Xft													
Rock bk L													
Rock ft R													
Rock bk L													
Touch R R													
R bk L													
R ft L													
R bk L													
Step R R													
(Hold)													
Close L-R													

APPENDIX C-2

Wandering Rose Performance Score Sheet

Subject ____ Testing ____ Performance ____ Date ______

Movement	P	S	Musicality 0	1	2	Precision a	b	c	d	e	f	g	h
Step R													
Catch L													
Step Lbk													
Step R pl													
Step L fd													
Step R fd													
Turn R													
Step L													
Step R													
Kick L Xft													
Step L)													
Step R)													
Step L													
Catch R													
Step R fd													
Kick L													
Step L Xft													
Back R													
Back L													
Back R													
Back L													
Back R													
Step L L													
Step R R													
Step L Xft													
Step R bk													
Step L L													
Step R fd													
Pressup R													
Step L													
Pressup L													
Step R													

(con't.)

Movement	P	S	Musicality 0	1	2	Precision a	b	c	d	e	f	g	h
Step L													
Catch R													
Step R bk													
Step L pl													
Step R fd													
Step L fd													
Turn L													
Step R													
Step L													
Kick R Xft													
Step R)													
Step L)													
Step R													
Catch L													
Step L fd													
Kick R													
Step R Xft													
Back L													
Back R													
Back L													
Back R													
Back L													
Step R R													
Step L L													
Step R Xft													
Step L bk													
Step R R													
Step L fd													
Pressup L													
Step R													
Step L L													
Touch R-L													

APPENDIX D

PERFORMANCE QUALITY EVALUATION

Thank you, immensely, for agreeing to rate these dances. As part of my research into expert/novice differences in the ability of individuals to learn from a demonstration, I feel that content accuracy is only one indicator of performance success. The elusive "quality of performance" is also important and seems likely to vary with experience.

Performance quality is obviously a subjective measure. To guide you, I have developed the following suggestions:

--Rate performances on a scale of 1 - 10,
10 indicating a superior performance,
1 indicating a very poor/weak performance.

--The content you observe will vary considerably, and it is not your primary concern to determine whether the actions are "right" or "wrong". However, your general impression of quality will obviously be affected by the range of movement (continuous action to wandering and standing) which you observe. Movements which appear disjointed probably are (wrongly so) and should also be allowed to influence your rating. Transitions should be smooth, letting the action flow logically and effectively.

--An appropriate use of space should be noted. This is very difficult to assess due to the testing situation. Never-the-less, your general impression of quality will probably be affected.

Two dancers face the back during their performance. Difficult though it will be, try not to let this influence you. "Orientation" was considered in the performance accuracy measurement.

--Both pieces have strong underlying rhythms. The performers' musicality should be apparent in their ability to adhere to the beat while exhibiting unified movement patterns. There are no sequences of action deliberately in opposition to the musical accompaniment.

--Movement clarity is important. Obscure, confused-looking steps and/or gestures should negatively affect your evaluation.

--Body parts should move as a coordinated unit. Legs, arms, fingers and feet should be fully extended/stretched in obvious kicks and distinctive arm/hand movements. Curled fingers and "dead fish" feet don't belong. (There are no flexed feet actions in either dance.) The head should be up, except in a few places where it clearly follows the movement. The torso should relate to the total action, creating a harmonious body shape.

--The performers should project the impression of "dancing" each piece--confident, purposeful--"selling it". There should be energy and enthusiasm in their production.

--The Wandering Rose jazz style involves movements which are strong and sharp, yet fluidly coherent. Although there are some "unusual" body shapes and unexpected arm-leg combinations, each action is designed to link naturally with those before and after it.

Shepherd's Crook is precise and deliberate. The torso should be upright without being stiff. The hand is either placed strongly on the hip or is held in a graceful arch (elbow slightly rounded but not bent) overhead. The foot work should be smoothly executed, even with the hopping which accompanies the "fling" steps.

You might consider observing the first 5 or 6 students before you begin to rate the dances. These performances represent the range of performance accuracy scores fairly well.

Again, MANY THANKS for your time and expertise!

Peggy

APPENDIX E-1

Experience Questionnaire

January 1990

To all participants,

I am trying to find out how past experiences determine how easy or difficult it is for people to learn to dance. Hence, I am interested in

(1) your previous dance experience,

(2) your experiences in sports which seem to be similar to dance in some ways, and

(3) all of your other sport experiences.

I am also interested in any previous experiences that may have "turned you off" of dance.

A better understanding of the effects of these past experiences should help us create better teaching and learning situations in dance--and perhaps in other motor skill areas as well.

I appreciate your taking time to complete this form carefully.

Thanks!

Peggy Downey

EXPERIENCE QUESTIONNAIRE:

NAME: ____

AGE: _____ SEX: ___ M ___ F PHONE: ________________

I--DANCE EXPERIENCE

1--Describe your dance experience, previous and current (participation, courses of study, etc.)

(a) None ___________
or
(b)

Dance Form	Setting (School, McGill, freetime, etc.)	No. of Years	At what Age?	Frequency (hrs/wk)
Current/Popular				
Social				
Square				
Folk				
Creative				
Jazz				
Classical Ballet				
Modern				
Tap				
Other				

2--Describe your dance performances, if any, before an audience (e.g. gym demos, dance school recitals, amateur musicals, professional work, etc. Do not include parents' class days):

Type of Production	Your participation	No. of performances

3--Describe any dance teaching which you have done:

(a) None ____________
or
(b)

Dance Form	Organization	Age of Students	Course Length (hrs./week; no. of weeks; no. of years)
Current/Popular			
Social			
Square			
Folk			
Creative			
Jazz			
Classical Ballet			
Modern			
Tap			
Other			

4--Rank your dance skill level in each of the following forms, using the scale indicated:

Place a checkmark below the appropriate number

0 = No experience
1 = Beginner
2 = Intermediate
3 = Advanced intermediate
4 = Advanced
5 = Professional

Dance Form	Skill level 0	1	2	3	4	5
Current/Popular						
Social						
Square						

Dance Form	Skill level 0	1	2	3	4	5
Folk						
Creative						
Jazz						
Classical Ballet						
Modern						
Tap						
Other						

5--Estimate the amount of time you have <u>observed</u> dance performances in any form:

Place a checkmark below the appropriate number

0 = once a year or less
1 = twice a year
2 = four times a year
3 = once a month
4 = once a week
5 = more than once a week

Where?	Average Frequency over Last 10 Years 0	1	2	3	4	5
On TV						
Movie musicals						
Live--amateur						
(specify)						
Live--professional						
(specify)						

6--Past experience(s), if any, which you feel has had a negative effect on your involvement or interest in dance (describe briefly).

II--RELATED EXPERIENCE

1--Describe your participation, past and current, in "similar" sports

(These sports are generally considered closed skills; the focus is on the the motor pattern produced, both its accuracy and its aesthetic quality, rather than on the performance outcome, e.g., scoring a goal.)

Sport	Setting (school, McGill, club, etc.)	No. of Years	At what Age?	Frequency (hrs/wk)
Gymnastics				
Figure skating				
Diving				
Synchronized swimming				
Free style skiing				
Ski jumping				
Other (list)				

2--Describe your participation or competitions in "similar sports":

Sport	Highest Level of Participation or Competition
Gymnastics	
Figure skating	
Diving	
Synchronized swimming	
Free style skiing	
Ski jumping	
Other (list)	

3--Describe any <u>teaching or coaching</u> you have done in these "similar" sports:

Sport	Setting	Age of Students	Course Length (hrs./week; no. of weeks; no. of years)
Gymnastics			
Figure skating			
Diving			
Synchronized swimming			
Free style skiing			
Ski jumping			
Other (list)			

5--Estimate the amount of time you have <u>observed</u> these "similar" sports, in any form:

Place a checkmark below the appropriate number

0 = once a year or less
1 = twice a year
2 = four times a year
3 = once a month
4 = once a week
5 = more than once a week

Where?	Average Frequency over Last 10 Years: 0	1	2	3	4	5
On TV						
Live--amateur						
(specify)						

Live--professional ____

(specify) ____

____

____

____

III--OTHER SPORT EXPERIENCES

1--Describe your participation, past and current, in other sports (e.g., soccer, hockey, football, basketball, track, downhill skiing, tennis, squash, swimming, etc.):

Sport	Setting	No. of Years	At what Age?	Highest Level Participation

2--Describe any teaching or coaching you have done in these sports:

Sport	Setting	Age of Students or Level of Play	Amount of Time (hrs./week; no. of weeks; no. of years)

5--Estimate the amount of time you have observed these sports, in any form:

Place a checkmark below the appropriate number	0 = once a year or less 1 = twice a year 2 = four times a year 3 = once a month 4 = once a week 5 = more than once a week

Where?	Average Frequency over Last 10 Years					
	0	1	2	3	4	5
On TV						
Live--amateur						
(specify)						
Live--professional						
(specify)						

APPENDIX E-2

Experience Questionnaire Scoring

<u>Experience in Dance and Related Sports</u> (pp. 3 & 7):

(Based on 15 hours of experience after age 5.)		<u>Points</u>
University or college course, 15 weeks, 2 hours/week	=	2
Elementary/secondary school, part of semester	=	1
"Free time" -- > 2 hours/week	=	.5
Other studies (studio, club, etc.)--≤ 4 hours/week, two terms/year	=	4
Aerobics, dance exercise -- ≤ 3 hours/week, one term	=	1

* Calculate per dance form/sport and sum.

<u>Teaching -- Dance and Related</u> (pp. 4 & 8):

One semester course, 15 weeks, 1 hour/week	=	1
Concentrated -- e.g., 3 weeks, 5 hours/week	=	1

* Calculate per dance form/sport and sum.

<u>Skill level -- Dance</u> (p. 4):

* Total score.

<u>Skill level -- Related</u> (p. 7):

Club/ recreational/school; beginner-->intermediate	=	1
Provincial	=	[illegible]
National	=	5

* Level X Sport and sum.

<u>Observation -- All catagories</u> (pp. 5, 8, & 12):

* Total score.

<u>Experience -- Other sports</u> (p. 10):

(Based on 15 hours of involvement after age of five.)

Examples:

Club for one season or 1 semester	=	2 points
Club for twc seasons or 2 semesters	=	4 points
Basketball for one semester, school	=	2 points
Hockey for two semesters, house league	=	4 points

* Calculate for each sport and sum.

<u>Teaching or Coaching -- Other sports</u> (p. 11):

Assessment similar to dance and related, based on 1 point for 15 hours of teaching or coaching.

* Calculate for each sport and sum.

<u>Skill level -- Other sports</u> (p. 10):

Beginner/"for fun") House league) Club team) Recreational)	= 1.0
City league	= 1.5
School intermural team	= 2.0
College team	= 4.0
University	= 6.0
Provincial	= 6.0
National	= 7.0

(University course : Beginner)

* Calculate for each sport by the number of years at that level. Sum.

APPENDIX F-1

Basic Skill Assessment--Instructions to Raters

All subjects will wear a number for identification.

All performances will be videotaped for additional analysis, if needed.

Each student will have only one opportunity to attempt each task.

Some tasks will be verbally described only (1,2,5,6).

Other tasks will be demonstrated as well as verbally described but with no rhythmic emphasis (3,4,7,8,9,10,11).

Tasks 1 - 10 will be performed on the diagonal of the room, in pairs.

Task 11 will be performed facing front, in pairs.

Raters will rank each task performance on a scale of 0 - 5.
Zero will indicate the task was completely wrong; five will indicate a well-performed task.

APPENDIX F-2

Basic Skill Assessment--Description of Tasks

1--Beat walks A--4/4 music
2--Beat walks B--3/4 music
For 1 and 2:
Walk on every beat of the music for 2 bars; walk on the first beat of the bar for 2 bars. Repeat.

3--Gallops: Forward--8 with R foot leading followed by 8 with L foot leading

4--Skips

5--Hops and leaps: 4 hops R, 4 hops L, 8 leaps

6--Stamp Clap: at least 8 times, alternating feet

7--Step ball change/two step: at least 4 repetitions

8--Skip run run: at least 4 repetitions

Tasks 9, 10 are done while running with tiny fast steps.

9--Two beats: at least 4 repetitions
Alternating arms--Touch shoulder (1), extend arm (2)

10--Three beats: at least 4 repetitions
Alternating arms--Touch nose (1), shoulder (2), extend arm (3)

11--(a) Grapevine R: down the length of the room
(b) Grapevine L: down the length of the room

APPENDIX F-3

Basic Skill Assessment--Guide to Rating

1--} --rhythm: "on the beat"
2--} --recognition of bars (i.e., 4/4 and 3/4 time)
--is there a movement accent when walking on every beat?

3---accuracy of step
hips square to front
rhythm (uneven)
transition from R to L
arms used for balance

4---accuracy
quality: height, knee up, feet stretched, arms balanced
rhythm (uneven)

5---difference between "hops" and "leaps"
balance
use of arms

6---coordination
rhythm (even)

7---change of lead foot
hips square
arms balanced
rhythm (1 + 2, 3 + 4, . . .)

8---high knee
opposite arm forward on skip
rhythm (1 [2] + 3 4)
alternating feet throughout repetitions

9--} --coordination
10--} --actually touch with hand
--rhythm: coordination of feet and arms

11---foot coordination
body control (no swivel hips, etc.)
arms controlled and balanced

APPENDIX G

Strategy Questionnaire

NAME: ______________________________

What DID YOU DO to help you learn the dances?

What other strategies COULD YOU HAVE USED to help you learn the dances?

What did you find particularly difficult in this learning situation? Why?