Elementary Students' Accounts of Optimal Challenge in Physical Education

James L. Mandigo and Nicholas L. Holt

Abstract

The purpose of this study was to examine elementary school students' accounts of optimal challenge. Twenty-seven children (aged 7-9 years) participated in semi-structured interviews during which they were shown a video-recording of their participation in a physical education class and invited to describe their experiences of optimally challenging activities. Interview data were transcribed verbatim and initially subjected to an inductive coding procedure. Data were then more interpretively analyzed to explore relationships between identified categories and explain the process of optimal challenge in physical education. Findings revealed that optimally challenging experiences were facilitated by (a) the provision of opportunities to modify the challenge level of the activity and (b) possessing enough skill or ability. Optimally challenging experiences were associated with feelings of positive affect (i.e., fun, enjoyment, and motivation to continue engaging in the activity). Findings are discussed with reference to the extant optimal challenge literature and future research directions are considered.

Key words: Motivation, Children, Positive Affect, Choice, Skill

The need to intrinsically motivate children has been emphasized by North American physical education (PE) organizations. The National Association for Sport and Physical Education (2003) stated that physical education teachers should "use developmentally appropriate practices matched with student-centered teaching styles to maintain active student participation and engagement" (p. 11). Canadian teacher education guidelines also highlight the importance of teachers adopting a "... flexible pattern of teaching that recognizes individual differences in motivation, capacity and learning style" (Canadian Association for Health, Physical Education, Recreation and Dance, n.d., p. 3). Thus, teachers need to be adequately prepared through preservice programs and professional development opportunities to structure physical education classes that foster student motivation. One approach that has been recommended is to create an environment that intrinsically motivates students by providing them with opportunities to be optimally challenged (Whitehead & Corbin, 1997).

Influential motivational researchers such as Harter (1978a), Deci and Ryan (1985), and Csikszentmihalyi (1990) have all identified *optimal challenge* as a fundamental construct within the heart of their theories of intrinsic motivation. Harter's Competence Motivation Theory, Deci and Ryan's Self-Determination Theory, and Csikszentmihalyi's Flow Theory have all suggested that optimally challenging experiences lead to enhanced intrinsic motivation. As Csikszentmihalyi observed, when people perceive their skills to be equal to the challenge of the activity, then they are likely to be optimally challenged resulting in the purest form of intrinsic motivation. Alternatively, when people perceive an activity to be too easy or too hard, they may experience boredom or frustration respectively. Deci and Ryan and Harter postulated that when an individual experiences success while optimally challenged, he/she is likely to be intrinsically motivated due to an increase in perceived competence. Experiencing success at easy tasks, for example, would not be as highly motivating as

experiencing tasks that are more difficult and matched to an individual's abilities. The consensus from all three of these theories suggests that facilitating opportunities for people to experience optimal challenge is critical to enhance perceptions of competence and intrinsic desire to participate in the task.

Within physical education literature, although different authors have used different terms to describe the construct of optimal challenge, the importance of finding a match between a child's skill level and the challenge of an activity has been widely recognized (e.g., Mandigo & Holt, 2002; Mandigo & Thompson, 1998; Mosston & Ashworth, 2002; Seidentop & Tannehill, 2000). These strategies are based on an interactionist approach, which considers both personal factors (e.g., skill level) and situational factors (e.g., task difficulty). The interactionist approach has been advocated as an important conceptual framework in which to understand children's motivation in ecological settings such as physical education classes (Lee, 1997).

The notion of including optimal challenge within an interactionist pedagogical approach can be traced back to the extensive body of literature devoted to Academic Learning Time (ALT). Parker (1989) defined ALT as the "... proportion of engaged time when the student was involved with materials that were appropriate to his or her abilities, resulting in high success and low error rates" (p. 195). When students' abilities are matched with an appropriate challenge, they are more likely to be more highly engaged in the task and hence maximize the potential for learning to take place (Metzler, 1989). For example, Danner and Lonky (1981) reported that elementary aged students spent significantly more time at reading stations that were equal to or slightly higher than their current skill level. Rogers and Ponish (1987) found that students were likely to spend more time and endure less success at a more challenging aiming task when they were provided with a choice of where to stand as opposed to being told where to stand.

When students are not optimally challenged, they will often change an activity to make it more enjoyable. For example, Sanders and Graham (1995) observed kindergarten students within a FE class taking part in many situations when they were considered "off-task" by the teacher. Although their ALT may have been low, the students were actually attempting to change the activity to make it optimally challenging for them. This often involved making the activity more challenging than how it was initially presented by the teacher. This finding demonstrates the importance of recognizing optimal challenge from the students' perspective in order to motivate them during their classes. Combined, this body of research demonstrates that the environment *and* the abilities of the individual need to be considered when structuring optimally challenging tasks.

Based upon the research, it appears that an interactionist approach to understanding how to facilitate students' optimal challenge may be most beneficial. An interactionist approach takes into consideration the interaction between the needs and abilities of the individual and the conditions surrounding the presentation of the task being asked of the individual (Lee, 1997). When the task and supportive environment are appropriately matched to the individual, a positive learning experience is created (Gagen & Getchell, 2004). However, due to a paucity of research in this area within physical education, a basic understanding of how children experience and describe optimal challenge and potential pedagogical strategies to help facilitate optimal challenging experiences are less understood. In other words, the research to date infers students' optimal challenge experiences by using objective indicators such as ALT, time-on-task, success to failure ratio, and affective outcomes closely associated with optimal challenge. What is needed, however, is research that examines how children describe optimally challenging experiences and the conditions of the learning environment that will enhance student learning through the provision of appropriately

matched tasks within PE (Metlzer, 1989; Rink 1999). As such, the purpose of this study was to examine elementary school students' accounts of optimal challenge to better understand how to facilitate such experiences.

Method

Participants

The sample was comprised of 27 children from Grades 2 *(n* = 14) and 3 *(n* = 13) at an elementary school in a large Western Canadian city, including 15 males and 12 females (aged 7-9 years). The elementary school was located on a university campus and was classified as an experimental learning school by the local school board. Participants were predominantly of Caucasian ethnic origin (>80%) and of middle-upper class socio-economic status.

Procedure

The University Research Ethics Board and school principal approved this study, and all participants and their parents/guardians completed standard informed consent procedures. The first author joined the physical education class as a teaching assistant for eight weeks prior to the interview period. At this time, the first author was a 28 year-old Caucasian male PhD student with several years working with children in recreation programs, organized sport, and physical education classes. During the eight-week rapport-building period the first author attended all of the students' physical education classes (i.e., two 30-minute physical education classes per week per grade). Thus, he achieved prolonged engagement in the setting, which provided opportunities for the development of trust and rapport with the participants before the interviews commenced (Patton, 2002). Once trust and rapport had been established, interviews were then conducted over an additional seven-week interviewing period.

The tasks in which the children were engaged during the seven-week interviewing period were lessons drawn from a variety of activity dimensions (i.e., gymnastics, games, individual activities, alternative environment, and dance) of the Provincial physical education curriculum (Alberta Learning, 2000). Both grades were taught by a female teacher who had been the physical education specialist at the school for two years, and who had earned degrees in both early childhood development and physical education based upon a movement education approach. In order to facilitate similar experiences, the content of the lessons during this period were the same for both grades. However, in order to help provide opportunities for learners to experience optimal challenge, the instructor demonstrated adaptability and flexibility through the presentation of various tasks in which the students were able to select the degree of difficulty and choice of equipment (Mosston & Ashworth, 2002). These strategies allowed the students to be active-agents within the class environment, which provided them with opportunities to negotiate the difficulty of the instructional tasks (Siedentop & Tannehill, 2000). During the actual delivery of the lessons the first author acted primarily as a teaching assistant, helping with equipment set up, class management, and providing formative feedback to learners.

Data Collection

Video recording procedure. All fifteen lessons over the duration of the seven-week interviewing period were video recorded in their entirety. To reduce any potential influence of the presence of the video camera on children's behaviors, it was set up during every lesson in the four weeks prior to the interview period. As a result, children became accustomed to having the camera in the class and soon became oblivious to its existence in the gymnasium. This helped to ensure that a more naturalistic environment was captured on video. The camera was located on a tripod in the corner of the gymnasium and the lens was set to a wide angle focus to capture as many of the activities and children as possible. The camera was set to 'record' and left unattended during the majority of lessons to avoid distracting the children.

After the lesson, video clips of two children 'in action' were identified. To select the video clips the first author viewed the entire lesson and identified two children who were featured in the frame participating in an activity for between 5-10 minutes. Once two children had been identified, they were invited to participate in an interview the next day. None of the children knew in advance of any given lesson when they would be interviewed.

Interviewing procedure. Within 24 hours of the video recording, each participant was invited to watch the video clip of him/herself during the physical education lesson from the previous day. The first author conducted all 27 interviews in a private laboratory on the University campus. Each child first watched a video clip (approximately 5 minutes) of her/him taking part in one activity from the previous day's lesson. The purpose of watching the video was to help facilitate recall of the previous day's lesson and to help the child to relax and reflect on his/her experiences during the selected task chosen on the video. At the end of the video clip, the participants were asked if they wanted to view the clip again. Then, the first author asked each child a series of questions about her/his perceptions of optimal challenge by using the video clip as a concrete example to initiate the conversation.

Interviews lasted 30-40 minutes. The initial questions were specifically related to the activities on the video clip and were designed to establish rapport and stimulate recall of the previous day's lesson. Questions related to participants descriptions of "just right", "challenging" and "sufficient skill to do an activity" were designed to elicit further descriptions of aspects of optimal challenge arising from the children's experiences in the wider context of physical education.[1] Thus, children provided their descriptions of the activities on the video *and* their descriptions of other types of optimally challenging activities. This approach to interviewing was designed to saturate the data collected about children's subjective experiences of optimal challenge, using the video clips to stimulate discussion and add to the depth of the data obtained.

Pilot tests. The video recording procedures and the interviews were pilot tested prior to the data collection for this study. To help establish the feasibility of the procedure five children (four males, one female) who attended a physical activity program (and were otherwise unconnected to this study) were video taped and later interviewed. Piloting helped to identify logistical problems pertaining to the video recording (i.e., setting up the video camera in an unobtrusive location while ensuring that activities were recorded appropriately) and to help ensure that the interview protocol and interview questions were developmentally-appropriate. The pilot test also provided the first author with an opportunity to hone his interview techniques with children. Once the video and interview protocol proved feasible, the study commenced.

Subjectivity monitoring. The first author maintained a reflexive journal (with 38 separate entries and over 100 pages of typed notes) during the seven-week period when the interviews were conducted. The reflexive journal comprised descriptive and reflective comments following each class and interview about how the first author may have been influencing the data and subsequently identified aspects of the interview that needed to be modified. For example, after the first set of interviews, the first author noted that he felt as if he was "towering" over the child during the interviews and subsequently, found a chair that allowed him to interview the remaining participants "at their level." Stuffed animals were also brought into the interview room to make the participants more comfortable with the environment. Another reflection that emerged was the first author's assumption that the word challenge had a single (positive) meaning. By the second interview, he noted that: "... there seems to be this

1. Readers are invited to contact the lead author for a copy of the interview guide that was used.

notion of good challenge and bad challenge where good challenge makes you feel good and bad challenge is where something is too hard for your skill level." As a result, subsequent interviews included probing questions that tried to differentiate between a "good challenge" and a "bad challenge".

Data Analysis

Descriptive analysis. Data were initially subjected to an inductive coding procedure by the first author. Interview data were transcribed verbatim then individual meaning units were identified from the interview transcripts through the process of micro-analysis (Strauss & Corbin, 1998). Micro-analysis involved detailed line-by-line analysis to identify salient units of meaning, whereby meaning was represented by a word, a sentence, or a paragraph. Similar meaning units were coded from individual transcripts and a coding scheme that comprised the four main categories presented in the results was developed. Each category was assigned a descriptive label which conveyed the essential meaning contained by the data housed in that category. The QSR Nvivo (2.0) software package was used to manage the data.

Throughout the analytic process, each meaning unit and each category was analyzed using the constant comparative method to ensure that the data in each category had been appropriately categorized. The initial analysis was corroborated by the second author, who has previous experience conducting qualitative research with children and adolescents (e.g., Holt & Morley, 2004) and taught qualitative research methods at undergraduate and graduate levels. The second author had no contact with the children who were interviewed, and therefore was able to act as a 'devil's advocate' asking questions about the first author's understanding and analysis of the interviews. He encouraged the first author to consider alternative explanations for the data (Patton, 2002), such as seeking to examine participants' explanations of non-optimally challenging experiences. Instances where the second author queried analytic decisions were settled through a process of advocacy and discussion (i.e., both researchers discussed their interpretations). The data were then placed in a data matrix (Miles & Huberman, 1994), which outlined idiographic profiles of each participant's responses (see Table 1).

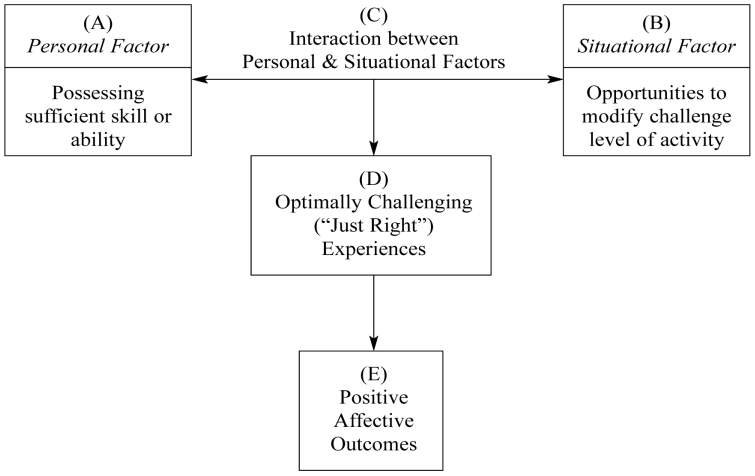
Interpretive analysis. The second stage in the analysis involved a more interpretative approach. The second author led the analysis during this stage, and his interpretations were later subjected to further scrutiny by the first author. This interpretive analysis was an attempt to understand how the data appeared to 'fit together' (and fit with previous theory/research) in order to explain the construct of optimal challenge in physical education. We followed Strauss and Corbin's (1998) techniques for the conceptual ordering of data, which represents a higher level of abstraction (i.e., interpretation) beyond description. Such a conceptual or interpretive type of analysis involved making deductions (i.e., hypothesizing relationships between categories) in order to formulate the data into a logical, systematic, and explanatory scheme. Our current findings were compared to previous research to see how and where the data connected to the literature (Corbin & Holt, 2005). Following several meetings and the creation of a series of diagrammatic representations of the findings, both authors agreed upon a conceptual scheme (Figure 1). We then developed a written explanation which represented the connections between the categories and children's interpretation of optimal challenge in physical education.

Results and Discussion

Overview of Findings

In the following section we present the key findings arising from this study, and discuss these categories in the context of previous research. Rather than present extensive quotations from several children, we present a limited number of quotes which convey the essential meaning of

Figure 1. Schematic representation of the process of optimal challenge in physical education.



each category. The number of children who provided a quote under each theme (see Table 1) is provided in order for the reader to make judgments about the saturation of the responses included in each category. Pseudonyms are used in place of participants' real names.

Descriptions of Optimally Challenging ("Just Right") Experiences

The term "Just Right" was used in the interviews in an attempt to use language that would be developmentally appropriate for children yet still consistent with the construct of optimal challenge. Twenty-six of the 27 children (97%) provided a description of "Just Right" that was consistent with the construct of optimal challenge. Just right represented a balance when an activity was perceived as being neither "too easy" nor "too hard." For example, the following extract revealed how David understood optimal challenge after he had just explained that the activity on the video was "Just Right" for him:

I: So if your friend was to ask you what 'Just Right' means, what would you tell her?

David: I would say it means that it is just right and it is really good for you and it is a really good level for you.

I: What do you mean by really good level?

David: Well, really good level means it is exactly good for you, it's exactly the same, it's really really good for you. Sort of like Goldie Locks and the Three Bears when she's trying the porridge... And the last one was just right.

I: Oh, so why was that one just right in Goldie Locks and the Three Bears?

Table 1

Data matrix of children's perceptions of optimal challenge in physical activity settings.

		Theme		
Participant	Optimally Challenging 'Just Right' Experience	Possessing Sufficient Skill or Ability	Opportunities to Modify the Challenge Level of the Activity	Positive Affective Outcomes
David	+	+	+	+
Matt	+	+	+	+
Elaine	o	o	+	+
Keith	+	+	+	+
Kate	+	+	+	+
Kathleen	+	+	+	+
Frank	+	+	o	+
Mike	+	o	o	+
Adam	+	+	o	+
Karen	+	+	o	+
John	+	+	+	+
Becky	+	+	+	+
Richard	+	+	o	+
Libby	+	o	+	+
Kay	+	+	+	+
Jolene	+	+	+	+
Brian	+	+	+	+
Gavin	+	+	+	+
Paul	+	+	o	+
Donna	+	+	+	+
Holly	+	+	+	+
Laura	+	o	+	o
Shannon	+	+	+	+
Heather	+	+	+	+
Carole	+	o	+	+
Ken	+	o	+	+
Lee	+	+	+	+
Totals	26	21	21	26

Note: Pseudonyms are used for all names.
Note: + indicates that the theme was reported during the interview; o indicates that the theme was not reported during the interview.

David: Because it was not too hot and not too cold and this [activity] was not too hard and not too easy.

This extract epitomized the notion of optimal challenge in physical education being "Just Right" for the children. David's use of the 'Goldie Locks and the Three Bears' story was interesting in that it appeared to provide him with a means of describing optimal challenge. Similarly, other participants used metaphors to describe optimal challenge (e.g., comparing optimal challenge to various difficulty levels on a climbing wall, or wearing ice skates on a frictionless surface). These descriptions may be reflective of the children's level of social-cognitive maturity and their restricted ability to conceptualize an abstract concept such as optimal challenge (Crain, 1992). In other words they used more concrete descriptions and language that was relevant to them to describe optimal challenge.

Implication. Anderson (2001) encouraged physical education teachers to use children's language and appropriate metaphors (or 'picture words') to add life to descriptions and portray sensations and imagination. We found that metaphors and stories provide teachers with ways of describing optimal challenge in a concrete and developmentally-appropriate manner.

Opportunities to Modify the Level of Challenge

Twenty-one children (78%) reported that when they had opportunities to manipulate the challenge level of an activity they were able to structure optimally challenging experiences. For example, Lee said that the ability to exert some control over the task content was important:

> Well, if it is a sport, I can't change it, then I'd quit, but if it is something like a game I am doing, I think I'd change the rules. I think 'this is getting out of control and it is way too hard' so I think I should change the rules. But if it is a sport that I can't change the rules, it is stuck that way and nobody can change it. I'll either follow the rules and learn more about and get happier. If that doesn't work, quit.

For Kay, it was important for her to change an activity in order to make it more challenging. When asked to describe a skipping activity that was easy for her, she indicated that she would make it harder because: "I am already good *[at]* skipping and I think I should make it more challenging by doing more tricks, really hard tricks that I do."

Implication. The notion of providing opportunities to modify the task is a central component of pedagogical strategies designed to promote optimal challenge in physical education (e.g., Mosston & Ashworth, 2002). As Siedentop and Tannehill (2000) proposed, learners can *negotiate tasks* within the boundaries established by the teacher to make the task easier or harder so that it fits their individual needs, abilities, and interests. Similarly, the current data suggested that providing children with opportunities to modify the challenge level of the task (rather than changing the entire task itself) were important. Previous research corroborates the present finding. Turner, Parkes, Cox, and Meyer (1995) found that when children's skill levels did not match the challenge of the task they would either make it easier (if it was too hard) or more difficult (if it was too easy) to enhance their enjoyment and engagement. Similarly, in a kindergarten physical education setting, Sanders and Graham (1995) observed that children associated opportunities to modify the task with subjective experiences of optimal challenge. Finally, Chalip, Csikszentmihalyi, Kleiber, and Larson (1984) reported that adolescents were more likely to report a balance between their perceived skill level and the challenge of an activity when they had opportunities to make their own decisions within the environment. Thus, both the present data and previous empirical research indicate that providing opportunities to modify the task is related to facilitating optimally challenging experiences.

Possessing Enough Skill or Ability

Twenty-one children (78%) reported that possessing a sufficient level of skill or ability influenced their perceptions of optimal challenge. The words "skill" and "ability" were used interchangeably by the children. This provides further evidence that the majority of the children perceived the construct of optimal challenge in a manner that is consistent with the theorists' description of optimal challenge (i.e., Csikszentmihalyi, 1990; Deci & Ryan, 1985; Harter, 1978a). Paul said that he liked an activity because "I have enough skills because I have known it for quite a long time." Similarly, Ken said, "You can actually do it, if you don't have any skill, it's like going to be hard, but if you have skills, you can do it if you practice." John provided a detailed explanation of matching his skill level to the challenge of the activity:

> Skill, well, it means that you are really good and you are really confident and you are going to do it [the activity] and you really know that you can do it ... You have enough skill that you can do it. Like, like if there is something that you've done before and you are trying to do something too hard, you would try to find the skill that is just right... and then automatically you try it and you can do it... If it is too hard then you try an easier way and then once you've done it, you keep trying, trying, trying, trying, trying until you get [better].

Implication. An important feature of optimal challenge is that it is individuals' *perception* of their skills and the perceived degree of challenge that impacts on their subjective experience (Dobos, 1996). Nicholls (1992) suggested that children are unable to differentiate ability from effort until the age of about 11 or 12 years old. Interestingly, the children in the current study were aged 7-9 years, so it is likely that they could not differentiate between effort and ability. As Paul's, Ken's, and John's comments demonstrated, ability was associated with effort (and practicing), which indicates that the children believed in the benefits of increased effort for improving ability or performance (Xiang, Lee, & Williamson, 2001). Whereas the verbatim reports showed that children thought they were optimally challenged when they had the 'skill' to perform an activity, in all likelihood, they were optimally challenged when they tried hard at an activity and experienced successful performance (cf. Biddle, 2001; Nicholls, 1992).

Positive Affective Responses to Optimally Challenging Experiences

Twenty-six participants (97%) associated optimally challenging (or "Just Right") experiences with positive affective responses such as enjoyment, fun, and motivation to continue engaging in the activity. All participants except Laura said that they "felt good" when engaging in an activity that was "Just Right." Libby said, "I would kind of say that what is just right for you are things you do that you want to do and that makes you want to feel good." In essence, "feeling good" appeared to be characterized by fun and enjoyment. Lee said a soccer activity was "Just Right" for him when "You'd see me really happy playing it and I'd be, I'd have a really happy look on my face [because] this is really fun. I'd like to do this all the time and I don't want to go home right now." Paul said about the video-taped activity: "It makes me feel challenged and it's fun and it makes me feel good because I am getting better at something." John appeared to experience a range of positive emotions when an activity was "Just Right" for him:

> Well, it makes me feel good because there is one thing that I really like doing that gives you an exercise and so my mom says I should exercise... When I try it and it feels good and I feel confident and I don't feel scared of doing it and I don't feel really nervous in doing it.

Implication. These data are corroborated by other findings on the outcomes of optimal

challenge. Mandigo and Couture (1996) observed that children reported highest levels of fun when their skills were balanced with the challenge of the activity. Alternatively, Sanders and Graham (1995) found that if a task was too easy or too hard, children were less likely to persist at the task. Researchers have also demonstrated that children who continually experience failure at a difficult task tend to withdraw from the activity (Rogers & Ponish, 1987). The current finding also supports the anticipated outcomes of pedagogical strategies in that optimal challenge is associated with positive outcomes (Mosston & Ashworth, 2002; Siedentop & Tannehill, 2000). Thus, the present data provided further support for the potential motivational benefits of promoting optimally challenging experiences in physical education.

Implications for Facilitating Optimally Challenging Experiences in Physical Education

Figure 1 conveys the result of our 'secondary analysis' whereby we considered how the data connected with existing research and how the different categories appeared to be related (cf. Strauss & Corbin, 1998). Consistent with contemporary thought, we approached optimal challenge in physical education from an interactionist perspective (Lee, 1997). In other words, we conceptualized optimally challenging experiences to be produced as a result of appropriate interactions between *Personal* and *Situational* factors. It appears that optimally challenging experiences in physical education occur when children perceive that they possess sufficient skill or ability (see (A) on Figure 1) and when they have opportunities to modify the challenge level of the activity to match their skill/ability level (B).

It seems that the interaction (C) of personal and situational antecedents is important for optimally challenging experiences (D) to occur. For example, if a child possesses a high level of skill but engages in an activity that is too easy for her/him, it is unlikely that optimally challenging experiences will result. However, if the child is able to modify the challenge of the activity there is a greater likelihood that she/he will experience optimal challenge. This interaction supports the relevance of pedagogical strategies related to the importance of providing children with choices that enable them to modify activities according to their own skill or ability level (e.g., inclusive teaching style, negotiation of instructional tasks).

For example, Goudas, Biddle, Fox and Underwood (1995) reported that students who were taught track and field lessons by a teacher who provided them with opportunities to make choices were more engaged and motivated during the class. Similarly, Mandigo and Natho (2005) reported that when campers at a residential camp chose the programs they wished to participate, they reported higher levels of optimal challenge and enjoyment. When not controlled by extraneous factors such as rewards and evaluation, children prefer to choose tasks that challenge their skills appropriately (e.g., Danner & Lonky, 1981; Harter, 1978b; Rogers & Ponish, 1987; Turner et al., 1995) and will often report detrimental outcomes such as negative affect (e.g., Chalip et al., 1987) and off-task behavior (e.g., Sanders & Graham, 1995) when opportunities to maintain or reach this balance are not provided.

Providing children with opportunities to experience success has also been linked to facilitating optimally challenging experiences (Harter, 1978a). As the results from this study demonstrated, when participants felt they could do a task successfully, they were more likely to feel a sense of being optimally challenged. However, success does not always have to be within the context of how well a student does in relation to others. Mandigo and Holt (2002) suggested that using self-competitive goals whereby students attempt to beat a previous personal score (e.g., run the 100 metres faster than before, catch a ball from a further distance than before) can be an effective pedagogical strategy to facilitate optimal challenge.

Teachers are encouraged to use developmentally appropriate terms such as "Just Right"

when providing children with choice. For example, Mosston and Ashworth's (2002) slanty rope metaphor within their description of the inclusive teaching style suggests that teachers can instruct students to 'jump over the part of the slanted rope at a height that is just right for you.' Based upon children's responses in this study and results from previous studies, this will result in students choosing an optimally challenging height that is not too low or not too high based upon their current skill level. Teachers can then encourage their students to improve their skills at a particular task whereby students try something more challenging by moving up the "slanty-rope" once they feel they have the skills to do so.

As a result of facilitating optimal challenge, teachers can expect to see "Positive Affective Outcomes" (E) such as enjoyment and increased effort result from students experiencing optimal challenge in their physical education class. Such outcomes are consistent with previous research that has investigated the positive impact this balance has on children's motivation. For example, Mandigo and Couture (1996) reported that when children perceived their skills and the challenge of game activities to be equal, they were more likely to report higher levels of fun. Turner et al. (1995) found similar results with a group of children in a grade five literacy class. When perceived challenge and skill were equal or slightly above average, students reported higher levels of affect, activation, cognitive efficiency, degree of engagement, and intrinsic motivation. Finally, Harter (1974, 1978b) reported that children are happiest when they take part in tasks that are neither too easy nor too hard.

Participating in optimally challenging tasks not only enhances student motivation, but also increases the potential for higher academic learning time to take place. Previous research has demonstrated that children will report higher levels of enjoyment and spend more time at tasks perceived to be optimally challenging (Danner & Lonky, 1981; Harter, 1974). Future research is recommended to investigate the impact that providing children with opportunities to negotiate the content and difficulty of instructional tasks has on students' level of academic learning time and its relationship to optimal challenge.

General Discussion

Findings revealed how children describe optimal challenge and how teachers can help facilitate optimal challenge in their physical education classes. The primary recommendation arising from this study is that teachers should structure physical education environments which enable children to be actively engaged in choosing tasks that will facilitate optimal challenge. Our conceptualization of optimal challenge in physical education is consistent with psychologists' original theoretical propositions about the construct (Csikszentmihalyi, 1990; Deci & Ryan, 1985; Harter, 1978a). There are also similarities between our findings and contemporary views of student learning and behavior in physical education. For example, Lee (1997) proposed that learners' characteristics and experiences combine with environmental variables to influence physical education outcomes relating to the student, the school environment, and the interaction of the two. Clearly this is an interactionist model of physical education which is consistent with our interpretations about optimally challenging experiences. Lee reflected that one implication of her model was that "we need to continue listening to students' voices about what constitutes meaningful, challenging, and authentic tasks for them" (p. 271). We suggest that the findings of the present study have contributed to this requirement.

Although we believe that the model (Figure 1) is consistent with our data and previous research findings, we cannot establish the direction of these relationships with certainty. Further research is required to corroborate our interpretations, and we present this model as a potential guide for subsequent investigations. Another limitation was our reliance on children's self-report data. Furthermore, although prolonged engagement was useful for developing rapport with the children

(Boggs & Eybert, 1990), the first author may have unduly influenced their experiences of optimal challenge through his involvement in their physical education classes. Finally, the sample for this study was 27 students at one Canadian elementary school, so the generalizability of findings to other populations is limited.

It will be important to examine both teachers' and students' perceptions of optimal challenge in the future (Hastie & Siedentop, 1999). For example, teachers' may feel an absence of control and appropriate management when their students are making the majority of the instructional decisions during the impact phase of the teaching-learning transaction. It would also be interesting to know if children participating in one type of task (e.g., student makes the majority of the decisions) experience optimal challenge differently than when engaged in other types of tasks (e.g., teacher makes the majority of the decisions). Ultimately, intervention studies whereby the construct of optimal challenge is manipulated would make a notable addition to the physical education motivation literature (Biddle, 2001).

As we have described, optimal challenge is conceptualized as an interaction between the child's (perceived) ability and the difficulty of the tasks. It seems the focus of some pedagogical strategies designed to foster optimal challenge is more on situational factors (i.e., modifying the task) as opposed to person factors. Our present data reinforce the importance of considering both the demands of the task *and* the students' ability levels, and acknowledging that both influence the experience of optimal challenge. The data also highlight the importance of using concrete examples (e.g., "Just Right") to help children understand and subsequently choose optimally challenging tasks. To this end, we hope that the descriptive findings and model (Figure 1) presented here provide useful information about creating effective learning environments that provide children with opportunities to be optimally challenged in physical education.

REFERENCES

Alberta Learning (2000). *Physical education: Guide to implementation.* Edmonton, AB: Alberta Learning, Learning and Teaching Resources Branch.

Anderson, A. (2001). *Learning strategies. The missing 'think' in physical education and coaching.* Toronto, ON: Sport Books.

Biddle, S. J. H. (2001). Enhancing motivation in physical education. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (2nd ed., pp. 101-128). Champaign, IL: Human Kinetics.

Boggs, S. R., & Eybert, S. (1990). Interview techniques and establishing good rapport. In A. M. Greca (Ed.). *Through the eyes of the child: Obtaining self-reports from children and adolescents* (pp. 85-108). Boston: Allyn and Bacon.

Canadian Association for Health, Physical Education, Recreation and Dance (n.d.). *Physical education 2000—Teacher education guidelines.* Ottawa, ON: Canadian Association for Health, Physical Education, Recreation and Dance.

Chalip, L., Csikszentmihalyi, M., Kleiber, D., & Larson, R. (1984). Variations of experience in formal and informal sport. *Research Quarterly, 55(2),* 109-116.

Corbin, J., & Holt, N. L. (2005). Chapter 5: Grounded theory. In B. Somekh & K. Lewin (Eds.), *Research methods in the social sciences* (pp. 49-55). London: Sage.

Crain, W. (1992). *Theories of development* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Csikszentmihalyi, M. (1990). *Flow.* New York: Harper & Row.

Danner, F.W., & Lonky, E. (1981). A cognitive-developmental approach to the effects of rewards on intrinsic motivation. *Child Development, 52,* 1043-1052.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum.

Dobos, J. A. (1996). Collaborative learning: Effects of student expectations and communication apprehension on student motivation. *Communication Education, 45,* 118-134.

Gagen, L., & Getchell, N. (2004). Combining theory and practice in the gymnasium: "Constraints" within an ecological perspective. *Journal of Physical Education, Recreation and Dance, 75(5),* 25-30.

Goudas, M., Biddle, S., Fox, K., & Underwood, M. (1995). It ain't what you do, it's the way that you do it! Teaching style affects children's motivation in track and field lessons. *The Sport Psychologist, 9,* 254-264.

Harter, S. (1974). Pleasure derived by children from cognitive challenge and mastery. *Child Development, 45,* 661-669.

Harter, S. (1978a). Effectance motivation reconsidered. *Human Development, 21,* 34-64.

Harter, S. (1978b). Pleasure derived from challenge and the effects of receiving grades on children's difficulty level choices. *Child Development, 49,* 788-799.

Hastie, P. & Siedentop, D. (1999). An ecological perspective on physical education. *European Physical Education Review, 5,* 9-29.

Holt, N.L., & Morley, D. (2004). Gender differences in psychosocial factors associated with athletic success during childhood. *The Sport Psychologist, 18,* 138-153.

Lee, A.M. (1997). Contributions of research on student thinking in physical education. *Journal of Teaching in Physical Education, 16,* 262-277.

Mandigo, J. L., & Couture, R. T. (1996). An overview of the components of fun in physical education, organised sports and physical activity programs. *Avante, 2(3),* 56-72.

Mandigo, J. L., & Holt, N. L. (2002). Putting theory into practice: Enhancing motivation through OPTIMAL strategies. *Avante, 8(3),* 21-29.

Mandigo, J. L. & Natho, K. (2005). Evaluating summer camper's quality of experience. *Palaestra, 21(2),* 26-31.

Mandigo, J. L., & Thompson, L. P. (1998). Go with their flow: Using Flow Theory to help practitioners intrinsically motivate children to be physically active. *The Physical Educator, 55,* 145-159.

Metzler, M. (1989). A review of research on time in sport pedagogy. *Journal of Teaching in Physical Education, 8,* 87-103.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis.* London: Sage.

Mosston, M., & Ashworth, S. (2002). *Teaching physical education* (5th ed.). San Francisco: Benjamin Cummings.

National Association for Sport and Physical Education (2003). *National standards for beginning physical education teachers* (2nd ed.). Reston, VA: NASPE Publications.

Nicholls, J. G. (1992). The general and the specific in the development and expression of achievement motivation. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (pp. 31-57). Champaign, IL: Human Kinetics.

Parker, M. (1989). Academic learning time — physical education (ALT-PE), 1982 revision. In P. W. Darst, D. B. Zakrajsek, & V. H. Mancini (Eds.). *Analyzing physical education and sport instruction* (2nd ed.) (pp. 195-205). Champaign, IL: Human Kinetics.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Rink, J. (1999). Instruction from a learning perspective. In C. A. Hardy & M. Mawer (Eds.). *Learning and teaching in physical education* (pp. 149-167). London, UK: Falmer Press.

Rogers, C. S., & Ponish, K. K. (1987, April). Control of level of challenge: Effects on intrinsic motivation to play. *Paper presented at the Society for Research in Child Development,* Baltimore, MA.

Sanders, S., & Graham, G. (1995). Kindergarten children's initial experiences in physical education: The relentless persistence for play clashes with the zone of acceptable responses. *Journal of Teaching in Physical Education, 14,* 372-383.

Siedentop, D., & Tannehill, D. (2000). *Developing teaching skills in physical education* (4th ed.). Mountain View, CA: Mayfield.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Newbury Park, CA: Sage.

Turner, J. C., Parkes, J., Cox, K. E., & Meyer, D. K. (1995). The role of optimal challenge in students' literacy engagement. In K. A. Hinchman, D. J. Leu & C. K. Kinzer (Eds.). *Perspectives on literacy research and practice. Forty-fourth yearbook of the National Reading Conference* (pp. 126-136). Chicago: National Reading Conference.

Whitehead, J. R., & Corbin, C. B. (1997). Self-esteem in children and youth: The role of sport and physical education. In K. Fox (Ed.). *The physical self* (pp. 175-203). Champaign, IL: Human Kinetics.

Xiang, P., Lee, A., & Williamson, L. (2001). Conceptions of ability in physical education: Children and adolescents. *Journal of Teaching in Physical Education, 20,* 282-294.

Dr. Mandigo teaches in the Physical Education and Kinesiology department at Brock University, St. Catherines, Ontario (Canada) and Dr. Nicholas Holt is on the faculty at the University of Alberta, Edmonton (Canada).

Author's Note: Funding for this study was provided by the Social Sciences and Humanities Research Council (SSHRC) of Canada.