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Revising And Extending The Notion Of Sport Commitment Model For Athletes With Physical Disabilities Using An Ecological Model

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ACCEPTANCE

This dissertation, REVISING AND EXTENDING THE NOTION OF SPORT COMMITMENT MODEL FOR ATHLETES WITH PHYSICAL DISABILITIES USING AN ECOLOGICAL MODEL, by WEI-RU “ANDY” YAO, was prepared under the direction of the candidate’s Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education and Human Development, Georgia State University.

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REVISING AND EXTENDING THE NOTION OF SPORT COMMITMENT MODEL FOR
ATHLETES WITH PHYSICAL DISABILITIES USING AN ECOLOGICAL MODEL

By

WEI-RU “ANDY” YAO

Under the Direction of Dr. Deborah Shapiro

ABSTRACT

The Sport Commitment model (SCM) is a well-known theoretical framework to illustrate how the psychological state of commitment to sport has been influenced and studied in able-bodied persons. Considering the characteristics and lived experiences of people with disabilities, additional antecedents of sport commitment were added in the structure of the SCM. In order to extend the application of this revised SCM to persons with disabilities, the concept of three levels (personal, social, and environmental) of Bronfenbrenner’s ecological model was employed to differentiate the impacts of nine antecedents to sport commitment. The primary purpose of this study was to examine the revised SCM in terms of the magnitude of contribution of nine antecedents (enjoyment, personal investment, involvement opportunities, social constraints, involvement alternatives, self-efficacy, negative consequence of sport participation, social support, and accessibility of sport facilities and settings) on sport commitment to athletes with disabilities. The second purpose of this study was to investigate the superiority between original and alternative sport commitment models (mediation and direct/indirect model). A total

of 157 adult athletes (Mean age= 34.87, SD = 11.78) with physical disabilities from team and individual sports across the United States, Europe, and Asia completed an online survey of 60 items across the nine antecedents hypothesized to influence sport commitment in athlete with disabilities. Results indicated involvement opportunities, followed by personal investment, were the strongest predictors of sport commitment ($R^2 = .65$). In contrast, enjoyment, social constraints, involvement alternatives, self-efficacy, negative consequence of sport participation, social support, and accessibility of sport facilities and settings had no significant prediction on sport commitment. Chi-square difference test showed the direct/indirect model ($\chi^2 (211) = 318.41$; RMSEA = .05; CFI = .97; SRMR = .06) had better goodness-of-fit indices than the mediation model ($\chi^2 (215) = 390.55$; RMSEA = .06; CFI = .95; SRMR = .11). Based on the principle of parsimony, the original model ($\chi^2 (215) = 384.95$; RMSEA = .07; CFI = .95; SRMR = .06) was deemed a better model to understand the mechanism of sport commitment than the direct/indirect model. The SCM was an effective theoretical framework for adult athletes with disabilities. However, it still requires more studies to understand its effectiveness to other developmental ages and stages of athletes with disabilities.

INDEX WORDS: Sport commitment, Athletes with disabilities, Ecological Model

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ABBREVIATIONS

PA	Physical Activity
SCM	Sport Commitment Model
SEM	Structural Equation Modeling
ITTF - PTT	International Table Tennis Federation – Para Table Tennis
SCQ	Sport Commitment Questionnaire
SSES	Sport self-efficacy Scale
NCSP	Negative Consequences of Sport Participation
SSS	Social Support Scale
ASFS	Accessibility of Sport Facilities and Settings
SPSS	Statistical Package for the Social Sciences
CFA	Confirmatory Factor Analysis

1 THE SPORT COMMITMENT MODEL: A SYSTEMATIC REVIEW AND APPLICATION TO DISABILITY SPORT

Sport participation and exercise for able-bodied persons, when undertaken regularly, are highly beneficial for health and physical well-being (Aarts, Paulussen, & Schaalma, 1997; Hirvensalo & Lintunen, 2011). These benefits have been found to be of equal, if not more important for individuals with disabilities (Dunn & Dunn, 2006; Martin, Eklund, & Mushett, 1997; Moola, Faulkner, Kirsh & Kilburn, 2007; Shapiro & Martin, 2010, 2014). Research involving persons with and without a disability has documented a strong link between physical inactivity and health-related problems such as coronary heart disease, type-II diabetes, obesity, clinical depression, and other chronic disorders (Gregory, Blanck, Gillespie, Maynard, & Serdula, 2012; Haskell, Lee, & Pate, 2007; Nocon et al., 2008; WHO, 2010; Wu, Zhang, & Kang, 2013). In addition to the physical and health benefits of physical activity (PA) major psychosocial benefits of PA for individuals with disabilities have been found to significantly increase self-perceptions ranging from global self-esteem to specific competence and self-efficacy, athletic identity, positive feedback from significant others, increased social inclusion, and enhanced social bonding and friendships (Martin, 2013; Misner & Darcy, 2014; Rimmer & Roland, 2008). In light of these benefits and outcomes, striving to promote commitment to lifelong sport participation and exercise should be a primary goal for sport and exercise researchers, practitioners, physical therapists, physical education teachers and coaches, who are dedicated to enhancing the well-being and quality of life of individuals with disabilities.

In order to promote sustained sport participation for individuals with disabilities, researchers need to provide a sound theory to, and specialists have to have researcher-based strategies for, effective practice. Rusbult (1980, 1983) identified and tested a framework to understand the concept of commitment in what she referred to as an investment model. The investment model

was proposed as a universal theoretical framework comprised of 3 factors believed to influence one's continued involvement in any aspect of life (e.g., personal relationships, work). These three factors include: satisfaction, alternatives, and investment to a relationship (operationally defined as an affiliation, connection, bond or association to a person, place or activity), and are theorized to affect one's steadfastness in the following ways. Satisfaction refers to the degree of positive affect to a relationship. If an individual is satisfied with and attracted to a relationship, he/she is more likely to maintain the status of their relationship. Alternatives refers to the lack of a better option beyond the commitment. Once an individual perceives that their needs cannot be fulfilled outside of the current situation, a person's dependence on the current relationship will likely increase. Investment refers to the balance between the resources "put in" and the costs of withdrawing from the relationship (Rusbult , 1980, 1983). For example, the more time a person spends on training to qualify for the Olympic/Paralympic Games, the harder to it will be to persuade him/her to stop training. Rusbult's investment model has been tested across a variety of settings such as romantic relationships, academics, friendships, and business (Etcheverry, Le, Wu, & Wei, 2012; Fu & Chen, 2015; Human-Vogel & Rabe, 2015; Rusbult, 1980; Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993).

Scanlan and colleagues (1993) argued that despite the operational definition of investment provided by Rusbult (1980, 1983) as discussed above, its meaning has varied greatly due to different contexts and settings in which it has been studied. Scanlan and colleagues (1993) believed the notion of commitment needed to be systematically investigated and discussed by considering the background and context of the sport domain. Hence, they evolved and modified the constructs of Rusbult's investment model, and developed a sport-specific theoretical model of commitment (sport commitment model; SCM Scanlan, et al., 1993) (see Figure 1.1) to examine the motivation underlying persistence in PA inclusive of organized sports. The three determinants

of commitment from the investment model were borrowed and applied to the SCM, and renamed attraction, involvement alternatives, and restraining forces, respectively, and redefined to relate specifically to the context of sport and PA. In the SCM, enjoyment represents the attraction variable. Enjoyment is defined as a positive emotional response that has consistently been demonstrated to be a major variable motivating athletes to participate in sports leading to greater sport commitment (Chu & Wang, 2012; MacDonald, Côté, Eys, & Deakin, 2011; Zahariadis, Tsorbatzoudis, & Alexandris, 2006). Involvement alternatives, refers to the attractiveness of other activities relative to the current one. Scanlan and colleagues (1993) believed that if a person has more opportunities to engage in other activities, for example, the loyalty to one's current activity might be shaken. Hence, having more involvement alternatives is linked to lower sport commitment. Lastly, three sub-constructs of restraining forces (personal investment, social constraint, and involvement opportunities) were developed and hypothesized to impact commitment in the following ways. Personal investment refers to personal resources (time, money, effort, energy) put into the activity, which cannot be recovered if one withdraws from sport or physical activity. Social constraints reflect that social norms create feelings of obligation to remain in the sport. The notion of involvement opportunities was defined as the values and benefits that can only be derived from continuing participation such as remaining fit, being with friends, mastering skills, etc. Therefore, it is hypothesized that the more personal resources people invest in their sport activity, the more people feel obligated to stay involved, and the less people value the benefits from the activity, leading to decreased commitment and possible withdrawal from sport and PA (Scanlan et al., 1993). Such relationships between constructs in the SCM and commitment have been verified to hold true in studies on able-bodied athletes and exercisers (Casper, Gray, & Stellino, 2007; Guillet, Sarrazin, Carpenter, Trouilloud, & Cury, 2002; Weiss & Weiss, 2007).

The SCM provides a valued perspective and theoretical framework to discuss sport participation of athletes with disabilities. For example, sport enjoyment has been identified as one of the strongest and most universal variables in supporting exercise and sport participation in youth disability sport (Martin, 2006). Jaarsma, Dijkstra, Geertzen, and Dekker (2014) found that people with disabilities have fewer sport opportunities and difficulties with accessing information in physical activity. These findings are associated with the concept of involvement alternative, and can be applied to our target population. Due to more limited opportunities to engage in sport and physical activity, athletes with disabilities may have less sport participation options beyond their current sports than those without disabilities. Hence, involvement alternatives might be a stronger determinant of sport commitment for athletes with disabilities than for able-bodied athletes. In addition, the cost of engaging in physical activity or sport can be an issue for people with disabilities (Jaarsma et al., 2014; Kars, Hofman, Geertzen, Pepping, & Dekker, 2009). Families of children with disabilities tend to have fewer financial resources due in part to increased costs for therapeutic intervention and adults with disabilities tend to have fewer financial resources due to lower income levels than persons and families without members with a disability (Littman et al., 2014). From a personal investment perspective, the financial resources dedicated to participate in exercise and sport (e.g., training, transportation, equipment) could increase motivation/commitment of persons with a disability to continue exercise and sport participation compared with able-bodied individuals. The SCM might be able to provide reasonable explanations in explaining the exercise and sport motivation in people with disabilities. However, before applying this theoretical model on this population, it is important to carefully examine what is currently known about the effectiveness of the SCM.

Since the SCM was introduced, this theoretical framework has been widely used to examine relationships between various determinants and sport commitment, and connections between

sport commitment and subjective/objective behaviors (e.g., self-report physical activity level/pedometers, respectively). In their initial report (Scanlan et al., 1993), 58% of the variance of sport commitment was accounted for by sport enjoyment and personal investment. Research, since 1993, has shown a wide range of fluctuation from 30% to 98% of the variance in sport commitment predicted by these same two constructs (Casper, et al., 2007; Wigglesworth, Young, Medic, & Grove, 2012). One of the possible reasons for this discrepancy is the existence of a moderator effect. The term moderator is used in this study to refer to the variables such as gender, level of skill competition, age, skill level, and type of disability impacting the direction and/or strength of relationships between independent and dependent variables. For example, motivation for participation shapes one's behaviors in the form of choices of sports, efforts for activities, and how long one persists, and could vary depending upon the moderator variables selected in a given study. The degree to which social constraints impact sport commitment may vary for different populations (e.g., individuals with versus without disabilities). In this case, population is a moderator variable interacting with the influence of social constraints on sport commitment. Based on the nature of social constraints, significant others may have different expectations that make people without disabilities feel more obligated to continue their sport participation than those with disabilities. Any of the aforementioned moderator variables could play a significant role in gaining a deeper understanding of the prediction of sport commitment. Considering the interaction effect, understanding how the moderators interact with the constructs of the SCM would help to more effectively implement the SCM-based strategies in real world settings for persons with a disability.

In addition to the predictive value of enjoyment and personal investment in predicting sport commitment, Weiss, Kimmel, and Smith (2001) found that involvement alternatives and social constraint also contributed to the prediction of sport commitment. More recently, researchers are

focusing on exploring potential antecedents of sport commitment such as social support, perceived competence, and perceived cost for their additional predictive value in understanding sport commitment (Scalan, Russell, Beals, & Scanlan, 2003; Weiss, Kimmel, & Smith, 2001; Weiss & Weiss, 2007). Scanlan and her team (2013) similarly are trying to identify new candidate commitment sources for future inclusion in the SCM model. Hence, if the success rate of prediction and potential antecedents can be identified from studied research, this information could help to better understand and extend the SCM and its application to persons with a disability.

Moreover, Scanlan et al. (1993) have conceptualized sport commitment as a multidimensional construct including “wanting to” commitment and “having to” commitment. “Wanting to” commitment has a strong link to the feelings of satisfaction with the relationship or activity. In contrast, “having to” commitment is associated with social pressure and constraints. These concepts parallel ideas innate to self-determination theory in that “wanting to” commitment is similar to intrinsic motivation while “having to” commitment is close the concept of extrinsic motivation. Based on the idea of multidimensional construct of commitment, Wilson and Colleagues (2004) investigated the relationship between 5 antecedents (personal investment, social support, satisfaction, social constraints, and involvement alternatives) and 2 dimensions of sport commitment. Their results initially supported the relationships proposed by Scanlan et al. (1983). However, due to a paucity of research findings, how the SCM determinants connect to these two dimensions of commitment and the strength of the relationship between sport commitment and actual behavior remain unclear.

Lastly, Weiss, Kimmel, and Smith (2001) presented two modified versions (mediation model and direct/indirect model) of the SCM in order to better understand and interpret the phenomenon of a person’s persistent course of action. They proposed that sport enjoyment might

be mediating the influence of the other four sources (involvement alternatives, personal investments, social constraints, and involvement opportunities) on sport commitment. The difference between the mediation model and direct/indirect model is the concept of complete or partial mediation. In the mediation model, enjoyment acts as a go-between the four antecedents of commitment and actual dedicated sport/exercise involvement. As for direct/indirect model, the effects of the four resources on commitment not only go through enjoyment to predict commitment, but also have a direct impact on the psychological state of desiring continued sport participation (Baron & Kenny, 1986; Weiss, Kimmel & Smith, 2001). Although these mediation and direct/indirect models of sport commitment demonstrated a satisfactory fit based on the results of structural equation modeling (SEM) (Weiss, Kimmel & Smith, 2001), the conclusion of superiority of these modified models still needs more testing.

In summary, moderator variables were discussed (e.g., skill level, gender)(Weiss & Halupnik, 2013; Weiss & Weiss, 2007) and potential antecedents (e.g., social support, perceived competence, perceived cost) (Choosakul, Vongjaturapat, Li, & Harmer, 2009; Weiss, Weiss, & Amorose, 2010) that have to be taken into consideration, and the relationships between these determinants and two commitment constructs (“wanting to” commitment and “having to” commitment) (Gabriele et al., 2011; Wigglesworth et al., 2012) and between commitment and actual behaviors that need to be considered together in order to fully understand the predictive value of the SCM and its potential to understand engagement in sport and PA. To date there has been no systematic review of the literature for the SCM. Such a review can provide insights into how far the research has come, what has been found, and how these research findings can be used to apply to individuals with disabilities.

The purpose of this study is to provide a critical review of the sport commitment model literature to (a) summarize moderator effect (age, skills level, and gender) on commitment

prediction, (b) distinguish the significance of determinants in the SCM, (c) identify potential predictors not initially part of the SCM (d) clarify the relationships between predictors of “wanting to” and “having to” commitment, (e) highlight alternative sport commitment models, and (f) understand the connection between sport commitment and actual behaviors.

Method

Search Strategy

A search was performed in PsycINFO, SPORTDisus, ERIC, and Academic Research Complete using three combinations of search terms related to the purpose of this review. The following keywords were used for the search: (a) sport commitment, (b) sport commitment AND regression OR exercise commitment, and (c) sport commitment AND predictor OR exercise commitment.

Procedure

Five inclusion criteria and two exclusion criteria were used to screen the articles. To be included in the review, articles: (a) were published between 1993, when the SCM was introduced, through June 2014; (b) were written in English and published in scholarly (peer-reviewed) journals; (c) had to include statistical results related to the prediction of sport commitment or exercise commitment with at least one predictor from the original SCM, (d) had to provide R^2 or path coefficient, from regression analysis or SEM explained by a predictor variable, and (e) the concept of commitment predictor had to align with the original definition of the constructs of the SCM. In contrast, reviews, book chapters, books, abstracts, posters, interviews, and narratives were excluded. Pure qualitative studies (e.g., interviews, participation observation, field notes, open-ended questions) were also excluded.

Three combinations of search terms yielded 282 articles from four databases. After evaluating titles, abstracts, and duplicates, 91 potentially relevant articles were retrieved. Next, 13

qualitative studies were removed due to incompatibility with our inclusion criterion. Based on the purpose, methods, and results, 53 articles were excluded because the prediction of determinants in sport/exercise commitment was not examined. After assessing full texts, a total of 25 articles fulfilled all the inclusion criteria, and were included in this review (see Figure 1.2). Two reviewers independently screened the 91 articles for compliance with the inclusion criteria. The two reviewers met to discuss all 91 papers to ensure 100% agreement on the selection of the papers for analysis.

Results and Discussion

The SCM has been widely used and tested across four continents (Europe, North America, Oceania, Asia) and seven countries (Spain, Greece, France, United States, Canada, Australia, Thailand).

Moderator Variables Effect on Sport/Exercise Commitment

From twenty-five articles, five studies reported demographic information in determining the relationship between the determinants and sport commitment. One of these five studies (Casper & Stellino, 2008) examined four moderator variables (age, sex, income, skill level) in the prediction of sport commitment. The remaining four only examined one demographic category in their studies. Carpenter (2001), Weiss and Halupnik (2013), and Wigglesworth et al. (2012) analyzed the predictors of sport commitment for both male and female participants, and Weiss and Weiss (2007) tested different skill levels on prediction of sport commitment. The following section highlights the use of the moderating variables of age, skill level, and gender on the prediction of sport commitment.

Age. Among the distribution of the ages of the participants in the studies reviewed fifty-two percent of studies (13 of 25 articles) targeted children and teenagers between the ages of eight to 19 years (Carpenter, 2001; Carpenter & Scanlan, 1998; Choosakul et al., 2009; Guillet et al.,

2002; Martin, 2006; Scanlan et al., 1993; Carpenter, Scalan, Simon & Lobel, 1993; Sousa et al., 2007; Weiss et al, 2001; Weiss & Weiss, 2007; Weiss et al., 2010; Williams & Kim, 2014; Zahariadis et al., 2006). The remaining 12 (48%) studies recruited adult and senior participants between the ages of 18 – 90 years (Alexandris et al., 2002; Casper et al., 2007; Casper & Stellino, 2008; Crocker & Augaitis, 2010; Gabriele et al., 2011; Jeon & Ridinger, 2009; Santi, Burton, Pietrantonio, & Mellalieu, 2014; Weiss & Halupnik, 2013; Wigglesworth et al., 2012; Wilson et al., 2004; Young & Medic, 2011; Young, Piamonte, Grove, & Medic, 2011).

There was only one study examining an age effect, the finding from which demonstrated that the SCM predictors (e.g., enjoyment, involvement opportunities) gained better prediction of sport commitment in young rather than older adults (Carpenter et al., 1993). However, taking the 13 articles (Carpenter, 2001; Carpenter & Scanlan, 1998; Choosakul et al., 2009; Guillet et al., 2002; Martin, 2006; Scanlan et al., 1993; Carpenter, Scalan, Simon & Lobel, 1993; Sousa et al., 2007; Weiss et al, 2001; Weiss & Weiss, 2007; Weiss et al., 2010; Williams & Kim, 2014; Zahariadis et al., 2006) examining youth participants and the 12 articles (Alexandris et al., 2002; Casper et al., 2007; Casper & Stellino, 2008; Crocker & Augaitis, 2010; Gabriele et al., 2011; Jeon & Ridinger, 2009; Santi, Burton, Pietrantonio, & Mellalieu, 2014; Weiss & Halupnik, 2013; Wigglesworth et al., 2012; Wilson et al., 2004; Young & Medic, 2011; Young, Piamonte, Grove, & Medic, 2011) examining adult participants together, the results showed that the predictors accounted for the same range of the variance (30% to 90%) across all age groups. Although the literature showed that the antecedents of the SCM might provide the same range of prediction across all age groups, a meta-analysis is encouraged to determine the average variance of each antecedent accounting for sport commitment.

Scanlan et al. (1993) argued for and developed the antecedents in the SCM based on their understanding of the characteristics of youth sport athletes and context, and recruited youth

athletes in their research to examine this theoretical model. In this way, the original intent of the SCM was to focus on the youth sport domain. Scanlan and colleagues assumed they would find different predictive values on sport commitment between youth and adult participants expecting the structures of the SCM to explain commitment in youth population more than with older adults. Surprisingly, the findings in the present study do not support this assumption that the SCM uniquely examines the motivation underlying persistence in youth-sport setting. The current findings suggest the SCM can be used to explain both youth and adult athlete's motivation for continuous sport participation.

Skill Level. Participants in 14 studies were involved in a specific sport, such as soccer, triathlon, tennis, swimming, handball, gymnastics, windsurfing, and basketball (Carpenter & Scanlan, 1998; Casper & Stellino, 2008; Casper et al., 2007; Crocker & Augaitis, 2010; Guillet et al., 2002; Jeon & Ridinger, 2009; Santi et al., 2014; Sousa et al., 2007; Weiss et al., 2001; Weiss & Weiss, 2007; Weiss et al., 2010; Wigglesworth et al., 2012; Young et al., 2011; Young & Medic, 2011). In contrast, another 7 studies reported recruiting participants from multi-sports (Carpenter, 2001; Carpenter et al., 1993; Choosakul et al., 2009; Martin, 2006; Scanlan et al., 1993; Weiss & Halupnik, 2013; Zahariadis et al., 2006). The remaining 4 articles studied participants involved in recreation-based activities and were recruited from health clubs, university classes, campus organizations, and community clubs (Alexandris et al., 2002; Gabriele et al., 2011; Williams & Kim, 2014; Wilson et al., 2004). A total of two studies (Casper & Stellino, 2008; Weiss & Weiss, 2007) provided objective measures of skill level to examine the differences between higher- and lower-level skill athletes on sport commitment prediction. The results showed that the SCM had better prediction on higher-level skill athletes than lower-level athletes. Such results support the rationale of the SCM. Scanlan et al (1993) proposed that elite athletes would theoretically require more investment, and they may value and anticipate more benefits and opportunities gained from

their sport participation.

A challenge to integrate previous research findings regarding effect of skill level of participants on sport commitment reflected a lack of a clear definition defining the skill levels of sports participants enrolled in the respective studies. It was challenging to compare the skill level, for example, between suburban little league program and club sports program participants because they may all have very organized training and competitive teams in their programs. More evidence and further examination is needed with clear and specific definitions of the levels of competition and skill levels of participants within and across sport activities for comparison purposes. For example, The National Collegiate Athletic Association (NCAA) has clear definition of level of competition, for Division I, II, and III. In youth soccer for example, skill level is differentiated by labels such as Classic I, Classic II and Classic III for boys divisions ages U14-U19. Such classification groupings would provide a descriptive method by which to examine differences in sport commitment by skill level. Skill level in disability sport is achieved through athlete classification. International Table Tennis Federation – Para Table Tennis (ITTF - PTT) has a 10-level classification system for athletes with physical disabilities based on evaluations of the athlete’s disability type, skill level, and physical condition of athletes.

Gender. Twenty-one of 25 articles (84%) recruited combined genders in their studies (Alexandris et al., 2002; Carpenter & Scanlan, 1998; Carpenter, 2001; Carpenter et al., 1993; Casper & Stellino, 2008; Casper et al., 2007; Choosakul et al, 2009; Crocker & Augaitis, 2010; Gabriele et al., 2011; Guillet et al., 2002; Jeon & Ridinger, 2009; Martin, 2006; Santi et al., 2014; Weiss & Halupnik, 2013; Weiss et al., 2001; Wigglesworth et al., 2012; Williams & Kim, 2014; Wilson et al., 2004; Young et al., 2011; Young & Medic, 2011; Scanlan et al., 1993). Three studies (8%)(female = 2) only focused on a single-gender (Weiss & Weiss, 2007; Weiss et al., 2010). The remaining 2 studies (8%) did not specify gender of the participants (Sousa et al., 2007;

Zahariadis et al., 2006).

Four of 25 (16%) studies examined the moderating effect of gender on the prediction of sport commitment. The SCM predictors have had mixed results on commitment prediction while considering the effect of gender. Both Carpenter (2001) and Casper and Stellino (2008) indicated that the SCM was a better predictor of male behavior than female behavior, while Weiss and Halupnik's (2013) study showed the opposite results. Taking the notions of "having to" commitment and "wanting to" commitment into consideration, more variance in females was explained compared to males in "wanting to" commitment; however, in "having to" commitment, the R square showed the contrary results, that the SCM constructs predicted a greater percentage of variance in males than in females (Wigglesworth et al., 2012). According to Eccles and colleague (1983), parents tended to emphasize the importance of skill improvement for winning games for boys while participating in physical activity. In this case, male athletes may internalize such perception of obligation from their parents and then lead to higher "having to" commitment than "wanting to" commitment. Instead, less stress of improving skills and winning games may result in higher "wanting to" commitment than "having to" commitment in female athletes.

There were no consistent results on the effect of gender on commitment from the aforementioned studies as there were too few studies examining gender. Poole (2001) found reasons for and the degree of female's commitment to exercise differed from that of male's. However, the lack of attention to the role of gender is somewhat surprising given that evidence clearly indicates gender is a critical factor in influencing motivation particularly in the sport domain traditionally perceived as masculine and male-dominated (Boiché, Plaza, Chalabaev, Guillet-Descas, & Sarrazin, 2014; Chalabaev, Sarrazin, Fontayne, Boiché, & Clément-Guillotin, 2013). Furthermore, an individual's motivation is affected by interacting with others and one's environment. Therefore, when examining one's psychological states (e.g., competence,

enjoyment, commitment), researchers need to consider how the social contexts, may cause or elicit a different gender effect on sport commitment. For example, Guillet, Sarrazin, Fontayne, and Brustad (2006) used the expectancy-value model of Eccles and colleagues (1983) to investigate the gender effect on the likelihood of their continued participation. The results indicated that female athletes had relatively less perceived competence in sport participation and also had increased intentions toward discontinued sport participation than male athletes.

There are three possible explanations for the limited number of studies examining the impact of gender on sport commitment. First, is the difficulty of recruiting a large enough sample size from both genders. Many researchers may choose not to split out their dataset by gender in order to gain statistical power in sport commitment prediction. A second potential explanation is that researchers may not be aware of or do not value the effect of gender on sport commitment and thus choose not to add this variable to their analyses. The results of this review have shown that the gender contributes different predictive value and highlighted different significant predictors on sport commitment. Based on these findings, researchers should continue to examine/confirm the effect of gender on youth sport commitment.

Significant Predictors of Sport/Exercise Commitment

The six most commonly used predictors of sport/exercise commitment reported in the literature included: enjoyment/satisfaction (n = 20), social constraints (n = 20), personal investment (n = 20), involvement opportunities/social opportunities/recognition opportunities (n = 16), involvement alternatives/attractive alternatives (n = 15), and social support/parental encouragement (n = 15). All six predictors demonstrated high success rate in predicting sport/exercise commitment (enjoyment/satisfaction, 95%; social constraints, 50%; personal investment, 90%; involvement opportunities/social opportunities/recognition opportunities, 75%; involvement alternatives/attractive alternatives, 80%; social support/parental encouragement,

53%). These six predictors contributed significant variance in representing and explaining the psychological state of the desire and resolve to continue sport participation. These findings were not only supported by statistics, but also verified by qualitative evidence that the six antecedents were critical to sport commitment (Scanlan, Russell, Beals, & Scanlan, 2003; Scanlan, Russell, Magyar, & Scanlan, 2009). Worth mentioning is that not only is enjoyment consistently found as a primary participation motive across various settings and contexts, but also personal investment is a salient predictor for commitment. The results remain true to and support Scanlan et al. (1993) findings that as long as individuals gain positive affect and are willing to invest their time, money, and effort in their sports and exercise, they will likely stay with their current activity much longer than those who put less resources in an activity in which they participated (Casper et al., 2007; Weiss & Halupnik, 2013; Williams & Kim, 2014; Weiss et al., 2001).

Similar results were found for athletes with disabilities. One of 25 studies in the current review tested the SCM by recruiting individuals with disabilities. The results, from Martin's (2006) study focusing on youth athletes with disabilities, showed that enjoyment explained 43% of variance in predicting sport commitment, which was consistent with other able-bodied research findings that enjoyment was the most significant and powerful predictor of sport commitment. To our knowledge, very few studies directly examined the relationships between social constraints, personal investment, involvement opportunities, involvement alternatives, and social support and commitment in athletes with disabilities. For social constraints and social support, several studies have identified the importance of the parent's role in influencing the sport behaviors of children with disabilities (Jaarsma, Dijkstra, Geertzen, & Dekker, 2014; Martin, 2006). Jaarsma et al. (2014) also indicated that the awareness of benefits, similar to the notion of the involvement opportunities, would become a strong motive in continued sport participation. In addition, people with disabilities had relatively fewer opportunities in sport participation (Martin, 2013), pointing

out the important role of involvement alternatives for sport commitment. Littman and colleague (2014) found that costs (personal investment) was of concern to participation in sport for people with disabilities. Hence, these SCM variables are of critical importance for athletes with disabilities and should be tested in this population.

Potential Predictors new to the SCM

In addition to the original five antecedents of SCM and the inclusion of social support added to the model in 2009, six additional antecedents (perceived cost, self-efficacy, perceived benefits, perceived competence, sport friendship quality, negative affect) were identified from 25 articles for predicting sport/exercise commitment. These six predictors have been examined one to three time(s) except perceived competence, which was tested five times. Only three potential antecedents (perceived costs & self-efficacy = 100%; perceived benefits = 50%) of sport commitment will be briefly discussed due to their success rate of prediction on commitment reaching at least 50%.

Perceived costs. Perceived costs was examined in three studies (Weiss & Halupnik, 2013; Weiss & Weiss, 2007; Weiss, Weiss, & Amorose, 2010). Even though all three papers did not specify the contribution of R-square of perceived costs in commitment prediction, they all indicated that perceived costs was a significant predictor with other antecedents of sport and exercise commitment. Perceived costs, originated from Rusbult's (1980) investment model, represents the downsides of participation, such as stress, pain, injury, missing out on social activity, and is negatively correlated to commitment. The more negative impacts from activity participation, the more likely individuals are to withdraw from it. Similar research findings suggested that perceived costs (e.g., pain, or excessive fatigue that can play a prominent role in the lives of some people with physical disabilities) could be a critical reason stopping people with disabilities from continued sport participation (Henderson & Bedini, 1995; Kang, Zhu, Ragan, &

Frogley, 2007; Nazli, 2012). The notion of perceived costs is the opposite side of the personal investment. Even though adding perceived costs into the SCM may increase the predictive value of sport commitment, it does not improve and extend the diversity of the antecedents of the SCM. However, examining perceived costs and personal investment are still encouraged in populations of persons with disabilities because it remains unknown which predictor is a stronger motive in keeping athletes with disabilities staying in their sports.

Self-efficacy. Another group of authors examined the construct of self-efficacy (Williams & Kim, 2014). In social cognitive theory, self-efficacy is the most frequently used variable, and is also treated as a central factor impacting one's continued exercise behavior. Williams and Kim (2014) found self-efficacy was a significant contributor in predicting commitment (scheduling self-efficacy, $\beta = .53$, $p < .001$; coping self-efficacy, $\beta = .23$, $p < .001$).

Worth mentioning, five of 25 studies examined in the present review looked at the concept of perceived competence, which was used interchangeably with self-efficacy. In this review, only one of these five studies (20%) indicated perceived competence as a significant predictor of commitment. There are two explanations for these different findings. First, Rodger, Markland, Selzler, Murray, and Wilson (2014) argued that the conceptualization of perceived competence and self-efficacy were different. Perceived competence is more global in terms of behavior (running versus a 100 meter race) and is typically determined by assessments of past accomplishments to figure out how good one is. Rodger and colleagues (2014) believed that perceived competence not only focuses on the ability to perform a task, but also includes considerations of the personal importance of a task. In contrast, self-efficacy is more specific to a time and context. Thus, Rodger and colleagues (2014) suggest that self-efficacy is merely emphasizing how one feels about successfully executing the behavior in the given circumstances in the future. Their results supported the statement of Deci and Ryan (2000) that perceived

competence has a weak correlation with behavior persistence. On the contrary, self-efficacy is theorized to be related, among other variables such as choice, effort, intensity, to behavior persistence. The same argument was applied in persons with disabilities by Dixon-Ibarra and Driver (2013), that the role of self-efficacy is crucial for physical activity participation. Second, Scanlan, Russell, Magyar, and Scanlan (2009) employed Scanlan Collaborative Interview Method (Scanlan et al., 2003) to clarify the impact and role of the newly added antecedent “perceived competence.” The results showed that even if perceived competence played an important role in a majority of motivation theories (e.g., self-efficacy theory, self-determination theory), the data indicated perceived competence as a source of enjoyment in the SCM rather than as a direct predictor of commitment. Although, so far, there was one study examining the effect of self-efficacy on commitment, further examination of it, instead of perceived competence is highly recommended.

Perceived benefits. Two groups of researchers each proposed another potential predicting factor of commitment, perceived benefits (Guillet et al., 2002; Weiss & Halupnik, 2013). Guillet et al, (2002) found that perceived benefits ($\beta = .79$) was a significant predictor of sport commitment, but Weiss and Halupnik (2013) did not. Even though the construct of perceived benefits was created as a new potential antecedent for commitment, the conceptualization of perceived benefits, which was very similar with involvement opportunities, was initially developed from Rusbult investment model (1980, 1983). No clear reasons were stated why both studies re-named involvement opportunities as perceived benefits. Our suggestion, based on the current findings, is to keep the concept of perceived benefits in the model, but to use the original name of involvement opportunities in order to avoid confusion.

Relationship between Predictors and “Wanting to” and “Having to” Commitment

A total of six of 25 studies tested “wanting to” and ”having to” sport commitment (Gabriele

et al., 2011; Santi et al., 2014; Wigglesworth et al., 2012; Wilson et al., 2004; Young et al., 2011; Young & Medic, 2011). These researchers showed inconsistent results on personal investment, involvement opportunities, and social support in respectively predicting “wanting to” and “having to” commitment. For example, in Young and Medic’s (2011) study, personal investment significantly predicted “wanting to” commitment ($\beta = .28$) only. But, in Wilson et al. (2004) study, personal investment predicted both “wanting to” commitment ($\beta = .61$) and “having to” commitment ($\beta = .42$). On the other hand, all these 6 studies indicated that “wanting to” commitment was consistently and significantly predicted by enjoyment, as well as involvement alternatives and social constraints, which were the major contributors for “having to” commitment.

Theoretically, “wanting to” commitment has been conceptualized as a strong link to the feelings of satisfaction. “Having to” commitment is bonded to social pressures or constraints (Scanlan et al., 1993). For example, enjoyment was conceptualized to associate with “wanting to” commitment, and involvement alternatives and social constraints should highly relate to “having to” commitment. According to these conceptualizations, we should be able to see one direction on each of the original five antecedents (enjoyment, involvement alternatives, personal investment, social constraints, involvement opportunities) either correlated to “wanting to” or “having to” sport commitment. However, these results examined 2 dimensions of commitment construct, partially support the assumptions of Scanlan et al. (1993) that enjoyment would be positively correlated with “wanting to” commitment, and social constraints and involvement opportunities would be positively associated with “having to” commitment. According to Scanlan et al. (1993), they argued that the existence of such findings was because the commitment could be reflecting either wanting to or having to continue, or some combination of the two. At any one moment in time, commitment can be seen as an integration of all the forces acting on individuals.

Therefore, considering the comments of Scanlan et al. and the principle of parsimony (Bentler & Mooijaart, 1989; Preacher, 2006), if a more complicated SCM differentiating between “wanting to” and “having to” commitment cannot help researchers better explain and understand the real world, it may be that researchers need to reconsider the necessity in examining 2 types of commitment constructs in the future.

Alternative Sport Commitment Models

Not only was the original sport commitment model tested across these 25 papers, but two modified versions (mediation and direct/indirect) of the sport commitment model, using enjoyment/satisfaction as a mediator between other predictors and sport commitment, was examined in 3 studies (Casper, et al., 2007; Choosakul, et al, 2009; Weiss, et al., 2001).

Weiss et al. (2001) concluded that the mediation model did not provide better goodness-of-fit indices ($\chi^2 = 431.9$, RMSEA = .08, CFI = .90, NNFI = .89) than the original model ($\chi^2 = 400.9$, RMSEA = .07, CFI = .91, NNFI = .90) and direct/indirect model ($\chi^2 = 400.9$, RMSEA = .07, CFI = .91, NNFI = .90). They also argued that the direct and indirect models seem to be the most theoretically and practically appealing because it provided more information on how the SCM determinants influenced the mediator (enjoyment) and outcome variable (commitment). Choosakul et al (2009) supported the findings of Weiss et al (2001) by examining the original model, mediation model, and direct/indirect model. Through goodness-of-fit indices, they believed the direct/indirect model ($\chi^2 = 2197.45$, RMSEA = .05, CFI = .98, NNFI = .97) was a better-fitting model than the mediation model ($\chi^2 = 2362.32$, RMSEA = .06, CFI = .97, NNFI = .97) and even the original model ($\chi^2 = 2197.45$, RMSEA = .05, CFI = .98, NNFI = .97). However, both researchers did not use chi-square difference test to examine the significance of chi-square index between the original model and direct/indirect model. A sound explanation of why the goodness-of-fit indices showed that the direct/indirect model was better than the original

model is the direct/indirect model had more parameters. Once the parameters were added in the model, the goodness-of-fit indices increased. However, researchers cannot be sure about the decreased goodness-of-fit indices of the direct/indirect model significantly differed from the indices of the original model without conducting the chi-square difference test. Casper et al. (2007) was the only study examining the chi-square differences between the original SCM model and modified direct/indirect model. Although the goodness-of-fit indices of the direct/indirect model ($\chi^2 = 1738.91$, RMSEA = .08, CFI = .94, NNFI = .93) was better than the original model ($\chi^2 = 1655.35$, RMSEA = .08, CFI = .95, NNFI = .95), the chi-square difference test showed that there was no difference between constrained model (original model) and larger model (direct/indirect model). In summary, there is no doubt that the direct/indirect model might provide more theoretical and practical information to better understand the real world setting, but still we need more solid and statistical evidence by conducting chi-square difference test between the original model, medication model, and direct/indirect model in the future.

Sport/Exercise Commitment and related Behaviors

A total of 6 research groups established a link between psychological state of commitment and actual behaviors (Casper, et al., 2007; Gabriele et al., 2011; Guillet, et al., 2002; Jeon & Ridinger, 2009; Williams & Kim, 2014; Wilson et al., 2004). Each of these six studies reported that sport commitment significantly explained subjective/objective behaviors, such as dropout, participation frequency, metabolic equivalent, stage of exercise behavior change, and physical activity level with R^2 ranging from 12% to 44%,.

From these studies, the significant and meaningful relationships between commitment and behaviors were supported. Guillet, et al. (2002) indicated that a higher commitment athlete was less likely to drop out of the activity they participated in. The remaining five studies accounted for a significant proportion of variance (12% to 23%) in PA level and participation frequency

(Casper, et al., 2007; Gabriele et al., 2011; Jeon & Ridinger, 2009; Williams & Kim, 2014; Wilson et al., 2004). These findings suggested that the SCM structure could effectively explain human behaviors. However, the effectiveness of the entire SCM and the connection between sport commitment and subjective/objective behaviors (e.g., metabolic equivalents, stages of exercise behavior change, physical activity levels), have not been tested widely in athletes with disabilities. Hence, testing the relationships between commitment and behaviors for this population are highly recommended to potentially improve health and quality of life of individuals with disabilities.

Conclusion

Moderators need to be considered while testing and applying the SCM. Skill levels need to be clearer and hierarchical definitions have to be written in the manuscript so that researchers and practitioners can more easily understand, replicate, and apply the research findings. Also, we need more research on gender differences. Moreover, considering the characteristics of persons with disabilities, some possible moderators to take into considerations include age of onset of disability, disability type, and severity of disability.

The determinants of the SCM have been demonstrated to effectively explain the psychological commitment and real world behaviors. Self-efficacy could be a potential antecedent worth re-examining in future studies. As for the perceived costs and perceived benefits, they can be put aside due to their similarity to the concepts of personal investment and involvement opportunities. In addition, even though the notion of multidimensional commitment has been proposed, the necessity of testing complicated models should be reconsidered if it does not help researchers and practitioners understand our world. Moreover, we encourage further examination among the original SCM, mediation model, and direct/indirect model by conducting chi-square difference test in order to identify the most predictable model.

Lastly, there has been little research using the SCM in sport and physical activity for

individuals with disabilities. Based on the current findings, the SCM has the potential to contribute meaningfully to understanding factors influencing long-term engagement of athletes with disabilities in adapted sport and physical activity. In order to fully understand how to use the SCM to promote and enhance sport and physical activity participation and benefits for persons with a disability, we suggest that researchers start by testing the full SCM on certain age, skill level, and disability type of athletes in order to gain an overall picture of how the determinants impact sport commitment of athletes with disabilities, and examine the relationships between sport commitment and subjective/objective behaviors. Also, conducting qualitative research (e.g., interview, field note) to reveal the insight motives is critical for researchers to know the unique determinants of commitment in persons with a disability.

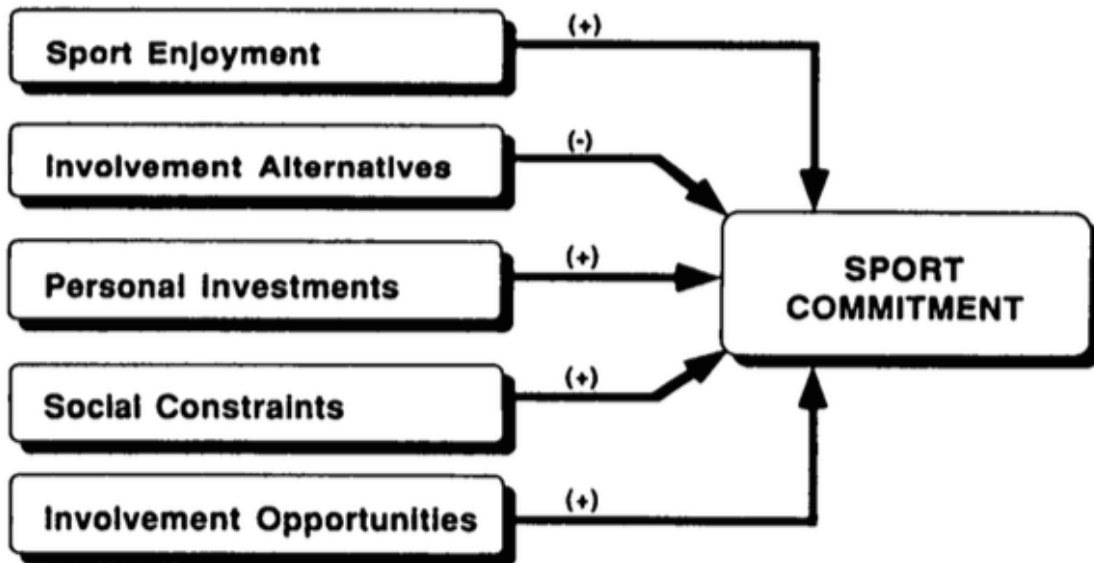


Figure 1.1 Sport Commitment Model. From Scanlan, T.K., Carpenter, P.J., Schmidt, G.W., Simons, J.P., & Keeler, B. (1993). An introduction to the sport commitment model. *Journal of Sport & Exercise Psychology*, 15, 1-15.

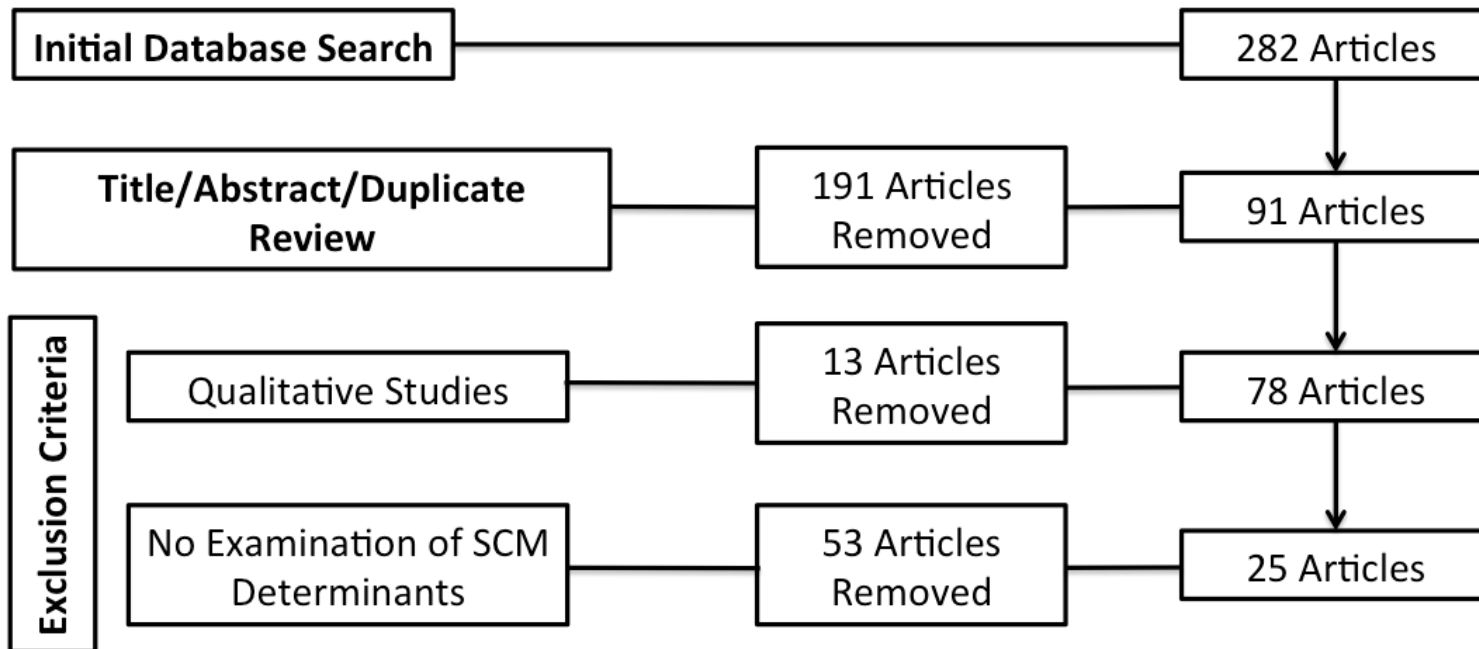


Figure 1.2 – Article selection flow chart.

Table 1.1 Summary of Included Studies

Authors (year)	Participants	Sports & Lv. of Competition	Predictors	Criteria	Major Results
Carpenter et al. (1993)	N = 1342 (m = 875; f = 467); Mean age = 13.97 (SD = 1.98)	National-wide football, soccer, & volleyball	SE, PI, IO, & SC	Sport commitment	Sport commitment was accounted for 68% of variance by sport enjoyment, involvement opportunities, personal investment, and social constraint.
Scanlan et al. (1993)	N = 178 (m = 83; f = 95); Mean age for boy= 10.78 (SD = .97); Mean age for girl= 12.49 (SD = 1.69).	Softball & basketball from suburban little league program	SE, PI, IO, & SC	Sport Commitment	Sport commitment was accounted for 58% of variance by sport enjoyment and personal investment.
Carpenter & Scanlan (1998)	N = 103 (m = 68; f = 35); Mean age = 15.98 (SD = 1.16)	High school soccer program	SE, IO, & SC	Sport Commitment	Sport commitment was accounted for 35% of variance by involvement opportunities.
Carpenter (2001)	N = 141 (m = 76; f = 65); Mean age = 15.61 (SD = 1.95)	Badminton, volleyball, table tennis, & soccer from recreational youth clubs	SE, PI, IA, IO, SC, & SS	Sport Commitment	Male sport commitment was accounted for 60% of variance by enjoyment and investment. Female sport commitment was accounted for 38% of variance by social support and enjoyment and investment.
Weiss, Kimmel, & Smith (2001)	N = 198 (m = 114; f = 84)	Junior tennis development	SE, PI, IA, PC, SC, & SS	Sport commitment	Sport commitment was accounted for 91.7% of variance by tennis enjoyment, personal investment, involvement alternatives, perceived

		programs			competence, and social constraints in the original model.
Alexandris et al. (2002)	N = 210 (m = 67; f = 143); Mean age = 33.6 (SD = 10.1)	Exercise and fitness in health clubs	EE, PI, IO, & SC	Exercise commitment	Exercise commitment was accounted for 44% of variance by enjoyment, personal investment, involvement opportunities, and social constraints
Guillet et al. (2002)	N = 253 (female only); Mean age = 15 (SD = .81).	Subdistrict or district handball competition	BE, PI, IA, & SC	Sport commitment	Sport commitment was accounted for 75% of variance by perceived benefits, involvement alternatives, and social constraints
Wilson et al. (2004)	N = 428 (m = 94; f = 334); Mean age = 32.85 (SD = 11.52)	College-based cardiovascular exercise classes	SA, PI, IA, IO, & SC	“Want to” & “have to” exercise commitment	“Want to” exercise commitment was accounted for 51% of variance by satisfaction, personal investment. “Have to” exercise commitment was accounted for 31% of variance by satisfaction, personal investment, involvement alternatives, and social constraints
Martin (2006)	N = 112 (m = 63; f = 49); Mean age = 15.33 (SD = 1.64)	Swimming & track and field in Western Australia Disability Association Championships	SE, PE, SFQ, & PPA	Sport commitment	Sport commitment was accounted for 43% of variance by sport enjoyment.
Zahariadis et al. (2006)	N = 153; Mean age = 13.5 (SD = 1.1)	Youth soccer, basketball, volleyball, handball, & water polo	SE, PI, IO, & SS	Sport commitment	Sport commitment was explained by sport enjoyment and personal investment.
Casper et al.	N = 537 (m = 247; f = 290);	Community tennis	SE, PI, IA, IO,	Sport	Sport commitment was accounted for 98% of variance by tennis

(2007)	Mean age = 47.5 (SD = 11.6)		SC, & SS	commitment	enjoyment, personal investment and involvement opportunities.
Sousa et al. (2007)	N = 437; Mean age = 15.6 (SD = .49)	Club soccer teams selected from the highest competitive level	SE, IA, & SC	Sport commitment	Sport commitment was accounted for 59% of variance by sport enjoyment and involvement alternatives.
Weiss & Weiss (2007)	N = 304 (female only); Mean age = 12.4 (SD = 2.3)	Private gymnastics clubs competing through level 5 to level 10	PI, IO, AA, SC, SS, PC, & PCO	Sport commitment	For level 5-6 gymnasts, sport commitment was accounted for 48% of variance by personal investment, perceived cost, coach social constraints, best friend social constraints, teammate social constraints, and coach social support. For level 8-10 gymnasts, sport commitment was accounted for 53% of variance by perceived cost, personal investment, and teammate social constraints.
Casper & Stellino (2008)	N = 537 (m = 247; f = 290); Mean age = 47.5 (SD = 11.6).	Community tennis	SE, PI, IA, IO, SC, & SS	Sport commitment	For 19-34 age group, sport commitment was accounted for 69% of variance by enjoyment, personal investment, and involvement opportunities. For 35-44 age group, sport commitment was accounted for 61% of variance by enjoyment, involvement opportunities, and social support. For both gender, sport commitment was accounted by enjoyment,

					personal investment, involvement opportunities, and social support. However, involvement alternatives was not a significant predictor for females ($R^2 = 52\%$), but was a significant predictor of commitment for males ($R^2 = 64\%$).
					For highest rated player, sport commitment was accounted for 65% of variance by involvement opportunities and involvement alternatives.
Choosakul et al. (2009)	N = 1244 (m = 669; f = 575); Mean age = 16.0 (SD = 1.46)	Twenty-two sports from youth national games	SE, PI, SO, IA, RO, SS, PA, & NA	Sport commitment	Sport commitment was accounted for 58% of variance by all the predictors except social opportunities.
Jeon & Ridinger (2009)	N = 139 (m = 110; f = 29); Mean age = 43 (SD = 11)	Windsurfing from professional to recreational	SE, PI, IO, SC, & SS	Sport commitment	Sport commitment was accounted for 68% of variance by intrinsic motivation (enjoyment, personal investment, involvement opportunities), and for 4.3% of variance by extrinsic motivation (social constraints, social support)
Crocker & Augaitis (2010)	N = 144 (m = 69; f = 75); Mean age = 35 (SD = 9.3)	Triathlon	PI, IO, IA, & SS	Sport commitment	Sport commitment was accounted for 56% of variance by personal investment, involvement opportunities, and involvement alternatives.
Weiss et al. (2010)	N = 304 (female only); Mean age = 12.4 (SD = 2.3)	Gymnastics competing at Levels 5–10 within USA	SE, PI, IO, IA, SC, SS, PC, & PCO	Psychological commitment	Sport commitment was accounted for 74% of variance by enjoyment, personal investment, involvement opportunities, attractive alternatives, and perceived costs.

Gymnastics

Gabriele et al. (2011)	N = 267 (m = 99; f = 168); Mean age = 26.34 (SD = 13.31)	A variety of exercise from university classes, campus organizations, private health clubs, and a community running club	SA, PI, & IA	“Have to ” and “want to” exercise commitment	“Have to” commitment was accounted for 74% of variance by satisfaction, personal investment, and involvement alternatives. “Want to” commitment was accounted for 82% of variance by satisfaction and personal investment.
Young & Medic (2011)	N = 424 (m = 220; f = 204); Mean age = 54.0 (SD = 11.5)	Swimming in Masters Aquatics World Championships	SE, PI, IO, IA, SC, & SS	Functional commitment & obligatory commitment	Functional commitment was accounted for 57% of variance by enjoyment, personal investment, involvement alternatives, and social constraints-children. Obligatory commitment was accounted for 47% of variance by personal investment, involvement opportunities, involvement alternatives, social support-healthy pro, and social constraints-partner, spouse, and children.
Young et al. (2011)	N = 190 (m = 91; f = 99); Mean age = 51.9 (SD = 1.95)	Swimming in Masters Aquatics World Championships	SE, PI, IO, IA, SS, & SC	Functional commitment & obligatory commitment	Functional commitment was accounted for 34% of variance by enjoyment and personal investment. Obligatory commitment was accounted for 14% of variance by personal investment, involvement alternatives, and social support.
Wiggleswort et	N = 507 (m = 235; f = 272);	Swimming in Masters	SE, PI, IA, IO,	Functional	For males, functional commitment was accounted for 44% of

al. (2012)	Mean age = 51.5 (SD = 11.8)	Aquatics World Championships	SC, & SS	commitment & obligatory commitment	variance by enjoyment For females, functional commitment was accounted for 49% of variance by enjoyment & personal investment. For males, obligatory commitment was accounted for 40% of variance by involvement alternatives, involvement opportunities, social constraints, and social support. For females, obligatory commitment was accounted for 30% of variance by personal investment, involvement alternatives, involvement opportunities, and social constraints
Weiss & Halupnik (2013)	N = 191 (m = 97; f = 94); Mean age = 10.5 (SD = 1.3)	Twelve sports in intercollegiate level	SE, BE, IA, PCO, SC, SS-C, SS-T, & SS-F	Strength and conditioning commitment	For male, strength and conditioning commitment was predicted by investments, enjoyment, best friend social constraints, and perceived costs. For women, strength and conditioning commitment was predicted by investments, enjoyment, and attractive alternatives
Santi et al. (2014)	N = 523 (m = 330; f = 193); Mean age = 39 (SD = 10.42)	Master swimmers	SS-C, SS-T, SC-C, & SC-T	Functional commitment & obligatory commitment	Functional commitment was accounted for 21% of variance by coach and teammate support and coach constraints. Obligatory commitment was accounted for 21% of variance by coach and teammate constraints.
Williams & Kim (2014)	N = 217 (m = 111; f = 106); Mean age = 13.46 (SD = .89)	A variety of exercise from physical education class	SE, PI, SC, C-SE, T-SE, & S-SE	Exercise commitment	Exercise commitment was predicted by personal investment, task self-efficacy, and scheduling self-efficacy.

SE, sport enjoyment; EE, exercise enjoyment; SA, satisfaction; PI, personal investment; IO, involvement opportunities; IA, involvement alternatives; AA, attractive alternatives; SC, social constraints; SS, social support; PC, perceived competence; PPA, perceived physical ability; SFQ, sport friendship quality; PE, parental encouragement; PCO, perceived cost; SO, social opportunities; RO, recognition opportunities; PA, perceived ability; NA, negative affect; BE, benefits; SS-C, social support from coaches; SS-T, social support from teammates; SS-F, social support from best friends; SC-C, social constraints from coaches; SC-T, social constraints from teammates; C-SE, coping self-efficacy; T-SE, task self-efficacy; S-SE, scheduling self-efficacy.

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2 REVISING AND EXTENDING THE NOTION OF SPORT COMMITMENT MODEL FOR ATHLETES WITH PHYSICAL DISABILITIES USING ECOLOGICAL MODEL

Physical inactivity in the United States has become a growing concern over the past decade. The latest data from Healthy People 2020 by the Office of Disease Prevention and Health Promotion (ODPHP, 2016) indicated that only 21.3% of adults met the objectives for aerobic and muscle-strengthening activity in 2014. This same database showed a very small proportion of adolescents (21.6%), similar to adults, met current Federal physical activity guidelines for both aerobic physical activity and muscle strengthening activity in 2013. The phenomenon of physical inactivity to minority populations, such as people with disabilities, is even worse. Children with disabilities are reported to have fewer opportunities and are involved in lower levels of physical activity and sports than those without disabilities: 47.1% versus 26.1%, respectively (Wilhite, Martin, & Shank, 2016; Woodmansee, Hahne, Imms, & Shields, 2016). For adults and youth with disabilities, a high level of physical inactivity has been proven to have strong links to health-related problems, such as obesity, heart disease, and diabetes (Jaarsma, Dekker, Koopmans, Dijkstra & Geertzen, 2014a; Jaarsma, Dijkstra, Geertzen, & Dekker, 2014b; Martin, 2013). These secondary health conditions impact quality of life and activities of daily living in persons with disabilities more so than in able-bodied individuals (Rimmer, Rauworth, Wang, Heckerling, & Gerber, 2009). In contrast, participating in physical activity and sport regularly has been found to improve health-related quality of life, and associated psychological and physical benefits, such as decreasing depression and other risks for secondary health conditions, increasing social networks, friendship quality and social competence, improving self-esteem and self-efficacy, and developing motor skills and fitness, (Blinde & McClung, 1997; Dunn & Dunn, 2006; Martin, Eklund, & Mushett, 1997; Moola, Faulkner, Kirsh & Kilburn, 2007; Shapiro & Martin, 2010,

2014).

This paper investigated the influences of psychosocial factors on continued sport participation of athletes with a physical disability. To accomplish this goal, this paper was divided into three sections. First, a theoretical framework, Sport Commitment Model (SCM), explained how five critical factors influenced typical developing athletes' and potentially athletes' with physical disabilities commitment to their sport participation. Second, considering the diversity of people with disabilities, the sport commitment model framework was revised by adding four additional factors unique to people with disabilities to better explain the perceived commitment status of people with physical disabilities in sport settings. Third, when research involves disability topics, two common models of disability are usually employed: medical and social model. Medical model, focusing on the individual level, emphasizes disability as a "biological flaw" with the problems associated with disability residing internally within the individual that results in impaired body structure and/or function (Brittain, 2004; Haegele & Hodge, 2016). On the contrary, a social model of disability sees society and the environment (i.e., isolation and exclusion of persons with a disability from their community) as limiting individuals with a disability not one's body function (Haegele & Hodge, 2016). However, a theory of understanding sport commitment that bridges both the key concepts of the social and medical models is an ecological systems theory. Thus, the concept of an ecological model was introduced and used to categorize the characteristics of these nine factors into three levels, that were then associated with the SCM to create a new theoretical model for the study of applied and scholarly investigations involving sport commitment in athletes with physical disabilities.

Theoretical Background on the Study of Sport Commitment

Many psychosocial theories have been developed and tested to understand the impact of

and/or remediate the factors that contributed more significantly to increasing motivation of people with and without disabilities toward engaging in physical activity and sport. For example, Bandura's self-efficacy theory (1977) postulated four sources of self-efficacy (past performance, modeled behavior, social persuasion, psychological responses) that could strategically be targeted to enhance one's belief in successfully accomplishing a task. A person, who possesses high self-efficacy, is more likely to engage in physical activity or sport. In self-determination theory, Deci and Ryan (1985) distinguished two types of motivation (intrinsic and extrinsic motivation) that would lead to action. They also believed that one's motivation would be influenced by three basic human needs: autonomy, competence, and relatedness. The degree of satisfaction on these innate needs would either facilitate or undermine intrinsic motivation (Deci & Ryan, 1985). Individuals with a greater level of intrinsic motivation tend to be less likely to dropout from their activity than those with greater levels of extrinsic motivation. Ajzen (1991) proposed the theory of planned behavior to explain how attitude, subjective norm, and perceived behavior control influence intention to an action. He believed that individuals who have a more positive attitude towards an activity, feel obligated to do the activity, and who have resources to perform the required task, have higher motivation for physical activity and sport involvement. However, there are limitations of these theories. These theoretical frameworks are commonly used to describe initial engagement of physical activity and sport, and to portray, in general, an individual's motivation in physical activity and sport participation instead of to specifically delineate factors that lead to sustained motivation and long-term commitment to participation in physical activity and sport. From the perspective of lifetime physical activity, more knowledge about improving the duration of physical activity participation and exploring psychological states of committing to continued participation are also critical. Hence, the purpose of this study was to examine how

commitment to PA can enable practitioners to use a theory to develop programs and strategies to keep people with disabilities active.

Introduction of the Investment Model

A well-known theoretical framework called the Sport Commitment Model (SCM), adapted from the investment model (Rusbult, 1980) and developed by Scanlan, Carpenter, Schmidt, Simons, and Keeler (1993), has helped researchers better explore and understand the psychological state of athletes, who desire to pursue a persistent course of action in sport or physical activity participation. Rusbult (1980, 1983) proposed and conceptualized the notion of commitment, from which she developed the investment model. In the investment model, Rusbult clearly defined the causal relationship between antecedents, which she called causal conditions for the notion of commitment, and consequences. For consistency throughout this paper, the term antecedents described the factors believed to be relate to sport commitment. Three major antecedents (satisfaction/attraction, alternatives, and investment) were identified to impact (either degrade or promote) commitment to a relationship that was operationally defined as an attachment or connection to a person, a place, or a subject (see Figure 2.1). Satisfaction and attraction were seen as the primary factors of commitment to a relationship in the investment model. Satisfaction/attraction referred to the degree of positive affect associated with a relationship (Rusbult, 1980). The outcome value of the relationship and the individual's expectations of achieving the outcome would impact satisfaction/attraction to one's commitment. In short, when a person subjectively values a relationship and also expects to gain a high quality of the relationship, the state of satisfaction and attraction will be increased. Then, the status of the relationship was more likely to be maintained.

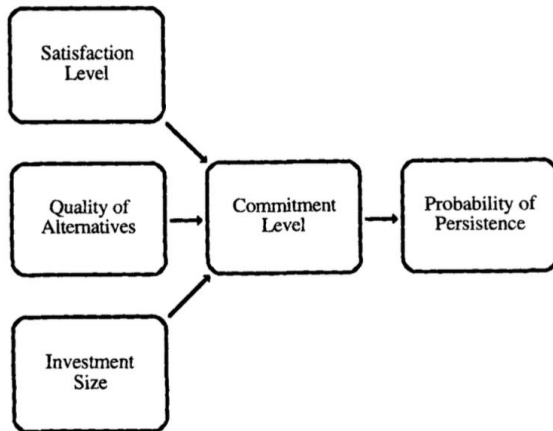


Figure 2.1 Investment Model. From Rusbult, C.E., Martz, J.M., & Agnew, C.R. (1998). The investment model scale: Measuring commitment level, satisfaction level, quality of alternatives, and investment size. *Personal Relationships*, 5, 357-391.

Commitment was also seen as a function of the relationship by comparing the outcome values between the current relationship to potential alternative relationships. People tend to evaluate alternatives as positive rewards. However, when two or more alternatives appear with the current relationship, individuals tend to unconsciously evaluate the relative difference of the current one and alternatives with rewards and costs. The high quality of and the increased numbers of alternatives would lead to more intrinsic and extrinsic investment of individuals on other relationships, reducing people's commitment to the current relationship (Rusbult, 1980). Hence, the more alternatives result in less commitment to a relationship. Moreover, commitment is not only affected by the outcome value of the current relationship and alternatives, but also by investment size, the magnitude and importance of the resource attached with a relationship. That is, committing to a relationship requires some non-refundable resources. The amount of investment put into a relationship and the costs of withdrawing from it will affect the degree of commitment. The more resources people put in and the more people lose from withdrawal, the

more people commit to the relationship. Two types of investment resources (i.e., extrinsic and intrinsic) have been differentiated (Rusbult, 1980, 1983). Extrinsic investment refers to extraneous interests and tangible objectives, such as a car, money, sponsorship, gifts, etc. The intrinsic investment of resources means some internal and untouchable objects, such as time, emotional involvement, energy, and so on.

Introduction to the Sport Commitment Model

Scanlan and colleagues (1993) considered the background and context of the sport domain and the three antecedent factors in the investment model when developing a sport-specific theoretical mode of commitment, the sport commitment model. Sport commitment was described as “a psychological construct representing the desire and resolve to continue sport participation” (Scanlan et al., 1993, p. 6). This psychological state of attachment represents a motivational force to continue involvement in a sport and is influenced by five major antecedents (see Figure 2.2) adapted from three antecedents of commitment in Rusbult’s investment model. In the SCM, sport enjoyment, defined as a positive affective response to the sport experiences (e.g., pleasure, happy, fun, liking), is representative of the concept of satisfaction/attraction in the investment model. Enjoyment has consistently been identified as one of the most crucial variables in motivating one’s continued sport participation (Chu & Wang, 2012; McDonald, Côté, Eys, & Deakin, 2011; Casper, Gray, & Stellino, 2007; Scanlan et al., 1993; Weiss & Halupnik, 2013; Zahariadis, Tsorbatzoudis, & Alexandris, 2006).

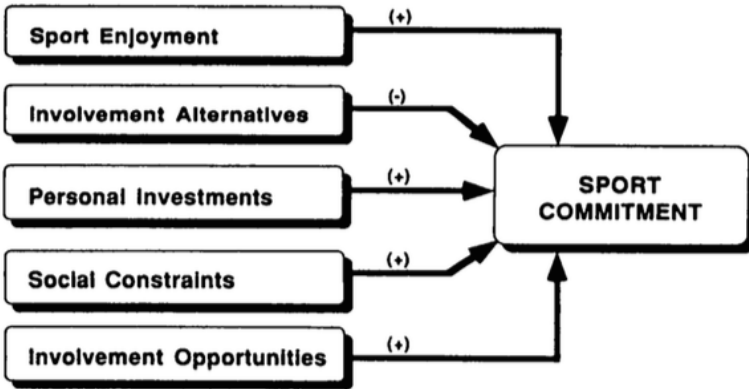


Figure 2.2 Sport Commitment Model. From Scanlan, T.K., Carpenter, P.J., Schmidt, G.W., Simons, J.P., & Keeler, B. (1993). An introduction to the sport commitment model. *Journal of Sport & Exercise Psychology, 15*, 1-15.

The concept of alternatives was taken directly from the investment model, and entered into the SCM as involvement alternatives. Involvement alternatives are defined as “the attractiveness of the best available alternative(s) to continued participation in the current endeavor ” (Scanlan et al., 1993). In brief, alternatives are opportunities for individuals to engage in other activities in place of the current sport. The more choices athletes have, the desirability of attending other activities and replacing the current one is likely to be increased. Hence, the relationship between involvement alternatives and sport commitment is assumed to be negative.

Three restraining forces were developed in the SCM. First, the notion of investment to a relationship in the investment model was borrowed to the SCM as personal investment. Personal investment specifically refers to the intrinsic resources (time, money, effort, energy) put into the activity, which cannot be recovered if one withdraws from sport or physical activity (Rusbult, 1980). Because these intrinsic expenses cannot be retrieved after the termination of participation, the degree of psychological attachment to the current activity would be enhanced by increasing

the amount of resources put into participation. Second, the concept of social constraints is another antecedent of sport commitment, not included in the investment model, but developed by Scanlan et al. (1983). Social constraints reflect social expectations and norms that create feelings of obligation to remain in the sport. Scanlan et al. derived the idea of social constraints from the notion of the social costs of termination proposed by Kelley (1983). They believed that people would perceive social pressure from significant others (e.g., parents, peers) to participate in sports. For example, people may stay in a sport they are not comfortable with just because his/her best friend wants him/her to, or children may feel bad to leave a sport program because it costs money for their parents.

The last antecedent construct in the SCM is involvement opportunities. Involvement opportunities refers to the values and benefits that can only be derived through continued participation in the current sport, such as remaining fit, making friends, mastering special skills, etc. The main point of this construct is focusing on the anticipation of positive outcomes from continued sport participation rather than requiring positive reinforcements after the completion of it. It was hypothesized that personal investment and involvement opportunities would promote greater sport commitment. The opposite relationship was expected between social constraints and sport commitment.

Sport Commitment Model in Persons with a Disability

Although the framework of the SCM is effective for explaining the relationships between the five antecedents (sport enjoyment, involvement alternatives, personal investment, social constraints, involvement opportunities) and sport commitment (Casper, Gray, & Stellino, 2007; Guillet, Sarrazin, Carpenter, Trouilloud, & Cury, 2002; Weiss & Weiss, 2007), with the exception of Martin's study (2006), this model has only been tested in typically developing individuals.

Martin used the framework of the SCM to examine the relationships between sport commitment and four antecedents, sport enjoyment proposed from the SCM and three other components (parental encouragement, sport friendship quality, perceived physical ability) derived from social cognitive theory developed by Bandura (1997). The Pearson correlations indicated all four antecedents showed small to large significant correlations (sport enjoyment, $r = .66$; parental encouragement, $r = .21$; positive friendship, $r = .27$; perceived physical ability, $r = .45$) with sport commitment. However, multiple regression results demonstrated only sport enjoyment explained 43% of variance in sport commitment. This investigation was an initial step and provided preliminary evidence of the potential application of the SCM in athletes with disabilities.

Although all the antecedents in the SCM have not yet been examined collectively in persons with a disability in sport and physical activity, the original five antecedents (enjoyment, personal investment, involvement opportunities, social constraints, involvement alternatives) of sport commitment have been individually investigated for their relationships with motivation toward continued physical activity participation in people with disabilities. The following sections will provide a review of what is known about each of the five original antecedents from the SCM on physical activity participation in individuals with disabilities. Gaps in the literature and future research directions for persons with disabilities will be proposed.

Enjoyment. Martin's (2006) study confirmed the relationship between sport enjoyment to sport commitment for youth with physical disabilities. Shirazipour, Latimer-Cheung, and Arbour-Nicitopoulos (2015) investigated psychosocial determinants of parental decisions to support participation for children with physical disabilities. Parents indicated a major factor in maintaining their child's sport participation was their child's perceived or stated enjoyment of the sport program. As long as children enjoy sport participation, parents had confidence that their

children would choose to continue their involvement. A similar conclusion was found by interviewing people with disabilities. Wilhite, Martin, and Shank (2016) interviewed 14 adults with disabilities, and results indicated enjoyment as a vital factor to sustaining physical activity. Wilroy, Knowlden, and Birch (2016) examined five stages of behavior change (precontemplation, contemplation, preparation, action, maintenance), a component of the transtheoretical model to identify the readiness of persons with disabilities for exercise behaviors. They found that the exercise motive of enjoyment was higher for those in the maintenance stage than those in precontemplation. Together, these results indicate that enjoyment is a critical factor influencing one's motivation for physical activity and sport involvement and appears to be of equal importance for people with disabilities as it is for people without disabilities (Carpenter & Scanlan, 1998; Carpenter, Scanlan, Simons, & Lobel, 1993; Scanlan et al., 1993; Weiss et al., 2001). However, the magnitude of the contribution of enjoyment to people with disabilities the way we understand it for able-bodied people remains unknown, as well as the role of enjoyment as a mediating variable between other antecedents and sport commitment. More evidence supporting the role of enjoyment in continued sport participation for athletes with disabilities is needed.

Personal investment. Although few studies directly examined how personal investment influences continued sport participation of people with disabilities, some research provides indirect evidence to support this point of view. Shields, Synnot, and Kearns (2014) pointed out that socioeconomic status of people with disabilities could predict engagement in active-physical and skill-based activities. From their perspective, finances are a major consideration before engaging in sport, especially, for people with disabilities. Littman et al. (2014) elaborated on the importance of these expenses for people with disabilities. They found families of children with

disabilities and adults with physical disabilities had fewer financial resources due to lower income level and additional costs for therapeutic intervention than families without members with a disability. In other words, once people with disabilities involve themselves in their sports, their sense and impact of personal investment on sport commitment could be relatively higher than those without disabilities due to the decision to dedicate limited resources to sport or physical activity participation. In addition, Kurková and Nemček (2016) found that mainstream students had relatively less leisure time activities than typical developing children. They believed that increasing the leisure time activities of students with disabilities could develop their positive attitudes towards physical education (PE). The results of Kurková and Nemček (2016) suggested that the more time investment students with disabilities put into leisure time activity and PE, the more likely they would be to continue their involvement in physical activity. These individual findings support the concept that the personal investment construct may be applicable, and equally or more important, in persons with disabilities. Yet, the relationship between athlete's personal investments and sport commitment has yet to be directly examined in disability sport. Examining this relationship is important to confirm the value of personal investment on sport commitment for individuals with a disability.

Involvement opportunities. Yao, Shapiro, and Liao (2016) investigated the motives of parents for sending their children with disabilities to participate in physical activity. Parents with children with a physical, intellectual, hearing, and visual impairment completed an exercise participation motives questionnaire. Six motive constructs (personal fitness & skill improvement, social expectation & external factor, competition & challenge, social enhancement, positive emotion & friendship, and teamwork) were examined. Parents reported personal fitness and skill, teamwork, and positive emotion and friendship to be their top three reasons for their children's

participation in physical activity. Similar results were found from the perspectives of the parent's of children with disabilities. In the review conducted by Jaarsma, Dijkstra, Geertzen, and Dekker (2014), they found that relaxation, health, fitness, positive emotion, and increased self-efficacy motivated the involvement of persons with disabilities in sport and physical activity. Jaarsma, Dekker, Koopmans, Dijkstra, and Geertzen (2014) further investigated how these motives related to continued sport participation. The top 5 factors found in maintaining participation were health/physical fitness, fun/relaxation, social contacts, strength, and weight control. These findings indicate that involvement opportunities could explain the level of sport commitment in people with disabilities. Involvement opportunities could be a potential predictor of sport commitment in athletes with disabilities, but the items on existing questionnaires may not be able to reflect the values of participation for individuals with disabilities because these items were developed from the perspectives of typically developing athletes. For example, four items of involvement opportunities from the SCM questionnaire focus on benefits of competition (e.g., positive emotions from competition, travel experience), but not on social interaction with friends and coaches and positive emotions, which are major motives of individuals with disabilities for physical activity participation. The representativeness of the items may not be able to represent the needs and desires of sport participation in athletes with disabilities. The adequacy of instruments to assess involvement opportunities in athletes with disabilities is questionable. However, the validity issue of the instrument can be solved by using multigroup structural equation model (SEM) analysis (Hox & Bechger, 1995). The SEM can be used to investigate whether a specific model, by setting a parameter across multiple groups, fits equally well in different groups simultaneously. In this case, involvement opportunities questionnaire can be validated by using confirmatory factor analysis to see the degree of correlation between typical

developing athletes and athletes with disabilities. Hence, conducting a multigroup structural equation model analysis in testing measurement invariance between athletes with and without disabilities is encouraged to fully understand the impact of investment opportunities on sport commitment for persons with a disability.

Social constraints. The concept of social constraints is similar to the notion of subjective norms from the theory of planned behavior, in which social constraints was defined as one's perceived social pressure motivating one to perform desired behaviors (Ajzen, 1991). Several researchers examining the relationship between subjective norm and intention or subjective norm and behavior in people with disabilities indirectly supports the importance of social constraints on sport commitment. Jeong, Kim, and Lee (2015) investigated how parental normative beliefs impact intention in supporting physical activity participation for their children with disabilities. The results showed that normative beliefs was a significant predictor in predicting intention of supporting their children with disabilities in physical activity participation ($R^2 = .47$). Associating such findings with expectancy-value theory (Eccles et al., 1983), parent's normative beliefs for physical activity participation significantly and directly influenced a child's beliefs as well. Therefore, if persons with disabilities perceive more social pressure from significant others, they are more likely to continue their sport participation. However, both Eng and Martin Ginis (2007) and Kosma, Ellis, Cardinal, Bauer, and McCubbin (2009) showed the opposite results when testing the relationship between subjective norm and intention in people with disabilities. In their findings, although all three constructs (attitude, subjective norm, and perceived behavior control) from the theory of planned behavior explained intention in physical activity participation, subjective norm was not a significant predictor of intention in either study. A possible reason for these conflicting results may be due in part to a difference in the recruited

samples. Jeong et al. (2015) targeted children whose mean age was 11 years, whereas Eng and Martin Ginis (2007) and Kosma and colleagues (2009) recruited adults with disabilities. The difference in ages may reflect differences in the amount of influence provided by significant others. Subjective norm could play a role of negative social support. The impact of negative social support could have more power in influencing low autonomous and low self-regulatory children, who are highly dependent on significant others than are adults, who have higher autonomy and perceived behavior control. More examination of social constraints on sport commitment in athletes with disabilities is needed to tease out the role of significant others on sport commitment.

Involvement alternatives. Many researchers have indicated that people with disabilities tend to have relatively fewer sport and social activity opportunities than those without disabilities (Jaarsma, Dekker, Koopmans, Dijkstra & Geertzen, 2014a; Jaarsma, Dijkstra, Geertzen, & Dekker, 2014b; Martin, 2013). According to the definition of involvement alternatives, it is hypothesized that people with disabilities should have a higher level of commitment to their sport because they do not have other alternative activities from which to choose from and/or in which to engage. However, to our knowledge, there is no information to conclude whether involvement alternatives plays a role influencing commitment of athletes with disabilities to their sport as it is defined. National physical activity recommendations (US Department of Health and Human Services, 2008) encourage people with disabilities to engage in a variety of physical activity and sports in order to increase moderate to vigorous physical activity (MVPA) levels for purposes of reducing the risk of secondary health complications and improving quality of life. If researchers and practitioners want to enhance the commitment of athletes with disabilities toward physical activity and sport participation, the strategy of providing various and numerous involvement

options and opportunities could potentially decrease commitment to a given activity leading to withdrawal from activities. Hence, more research-based findings are needed to explain the value and role of involvement alternatives in the sport commitment of athletes with disabilities and its potential impact on health related quality of life for athletes with disabilities.

Unique Antecedents on Sport Commitment for People with Disabilities

Committing to long-term activity in sport requires strong motivation. Understanding considerations for physical activity and sport participation could yield important information for researchers to know the psychological state of athletes with disabilities, as athletes who overcome these challenges and barriers can be deemed having strong desire and resolve for continued sport participation. The literature discussing persons with disabilities in sport and physical activity has highlighted unique considerations that when applied to the sport commitment model may account for additional potential antecedents impacting sport commitment for persons with disabilities. Several of these variables will be discussed below with suggestions for how they may contribute to a greater understanding of commitment for people with disabilities involved in sport or physical activity.

Negative consequences of sport participation. For individuals with disabilities, a number of considerations regarding the consequences of physical activity participation stand out. These considerations can be categorized into two sub-factors: negative consequences and self-efficacy, respectively. Finch, Owen, and Price (2001) reported disability itself was a major factor constraining people with disabilities from continued participation in physical activity. Similar research findings supported their conclusion that disability itself was a major negative-influencer, which could result in negative consequences (e.g., physical pain, excessive fatigue) during or after physical activity participation that can subsequently lead to the decrement of the regular,

intense, and quality sport participation for individuals with a disability (Goodwin & Compton, 2004; Kang, Zhu, Ragan, & Frogley, 2007; Lieberman & MacVicar, 2003; Nazli, 2012). These disability related issues, however, when discussed in the research literature tend to describe the research participants rather than serve as an antecedent or mediating variable influencing sport commitment. The impact of disability related variables and/or their magnitude on sport commitment or to other antecedents of sport commitment have not been directly examined to our knowledge.

Self-efficacy. Self-efficacy is defined as one's belief in his/her own ability to complete a task and to reach goals (Bandura, 1977). According to self-efficacy theory, an individual, who possesses high self-efficacy, is more likely to stick with their current activity. In contrast, lack of confidence, or lack of capacity and skills were identified as another self-efficacy related personal-level barrier that can negatively impact one's desire and resolve for physical activity and sport participation. Dixon-Ibarra and Driver (2013) emphasized the importance and positive role of self-efficacy in influencing continued physical activity participation for people with disabilities. However, results of several other studies have indicated that persons with a disability tend to question their physical ability in successfully completing the demands and tasks from physical activity and sport settings. Such self-doubt could lead to early withdrawal from sport or physical activity participation (Heller, Ying, Rimmer, & Marks, 2002; Henderson & Bedini, 1995; Malone, Barfield, & Brasher, 2012; Shields & Synnot, 2014). The importance of self-efficacy and its impact on sport commitment in persons with disabilities is unquestionable. Hence, including and examining self-efficacy as an antecedent in the SCM could provide important theoretical validation for this construct in the model, its relationship to other antecedents of sport commitment, and the magnitude of its influence on sport commitment in athletes with

disabilities.

Social support. Significant others (e.g., parents, teachers, peers) play unique and important roles influencing physical activity participation of persons with disabilities. Scholl, McAvoy, Rynders, and Smith (2003) indicated that parents may restrict a child's physical activity participation due to concerns over safety or increased risk of injury or a lack of awareness of how a sport could be modified for their child with a disability. Lieberman, Robinson, and Rollheiser (2006) and Jaarsma, Dekker, Koopmans, Dijkstra and Geertzen (2014) pointed out the important role of peers in motivating one to participate in sport or physical activity. Peers can serve to both facilitate or inhibit sport participation for individuals with disabilities. Special Olympics athletes reported a primary motive for playing sports was to be with friends and make new friends (Shapiro, 2003). Similarly, Shapiro and Martin (2010) found that friendships in sport contributed meaningfully to quality of life by promoting positive affective states such as joy, satisfaction and excitement toward sport participation in youth athletes with physical disabilities. Conversely, a lack of friends and peers with or without disabilities with whom to play, limited independence or independent living skills among youth with a visual impairment would potentially decrease the level of physical activity participation. For example, Shapiro, Lieberman and Moffett (2003) found that if students with visual impairments had less physical and emotion support of friends and parents, decreased social competence and fewer friendships would reduce their motivation to get and/or remain involved in physical activity. In short, these findings suggest that additional social level variables including the role of significant others, knowledge of how to adapt sport and PE programming or facilitate friendships, may play a critical role impacting sport commitment of athletes with disabilities

Accessibility of sport facilities and settings. Environmental barriers such as architectural

barriers have been found to contribute to physical inactivity in people with disabilities (Rimmer, 2004; Ellis, Kosma, Cardinal, Bauer, & McCubbin, 2007; Martin, 2013; Scholl, McAvoy, Rynders, & Smith, 2003). Rimmer, Riley, Wang, and Rauworth (2004) and Tsai & Fung (2005) indicated that people with mobility disabilities and visual impairments had difficulties accessing the physical built environment. Persons with disabilities have had challenges accessing various indoor areas (e.g., toilet, elevators, dressing room) of fitness facilities and health clubs, as well as outdoor accessibility like transportation to get to facilities, curb cuts, narrow sidewalks, and poor lighting (Rimmer, 2004). The physical environment and the perception by people with disabilities of an unfriendly physical environment may limit or stop individuals with disabilities from engaging in long term physical activity and sport participation (Rimmer, 2004).

Lack of knowledgeable staff or poor physical education teacher preparation to accommodate and modify curriculum for persons with disabilities are additional barriers limiting accessibility to participation in sport and physical activity for people with disabilities (Lieberman, Houston-Wilson, & Kozub, 2002; Stuart, Lieberman, & Hand, 2006). Therefore, accessibility whether it be physical or programmatic is uniquely relevant to people with disabilities and should be added as an antecedent into the sport commitment model when researching or working with individuals with disabilities.

Ecological Systems Theory

Bronfenbrenner's ecological model (Bronfenbrenner, 1994) is a popular paradigm, in disability studies (WHO, 2001) and adapted physical education/activity (Hutzler, 2007; Ustün, 2003), used to describe the reciprocal effect of the environment on individuals and also on how individuals interact with their environment. In this reciprocal effect, Bronfenbrenner believes that an individual's development can be shaped by his/her characteristics and 4 ecological levels from

the environment: microsystems, mesosystems, exosystems, and macrosystems (see Figure 2.3). The microsystem is the closest environment, and includes influences from other significant others (e.g., family, peer, teacher), to individuals. Mesosystems refers to the systems of relationship among an individual’s microsystems or the interaction between microsystems. For example, when a parent repeatedly interacts with a physical education teacher or coach, both of them may set mutual goals for the child. Connecting two or more settings (e.g., home and school), in order to shape a child’s development, is the influence of the mesosystems. For the exosystems, it refers to the social system (e.g., social policy, school board, national organization), which does not have a direct impact, but still has influence on an individual’s development. Macrosystems involve the influences from culture and subculture in which an individual lives, including beliefs, values, and traditions that impact the way the individual is raised. The information provided from the ecological model allows individuals to explore and understand their psychological status, and also allow significant others and policy makers to make decisions to create a preferable environment to meet the needs of individuals with disabilities.

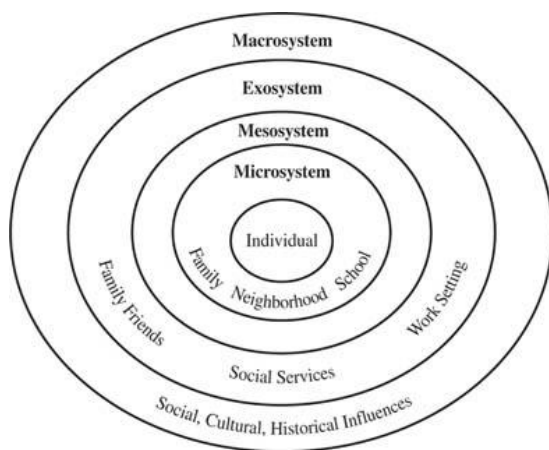


Figure 2.3 Bronfenbrenner, U. (1989). *Ecological Systems Theory*. In R. Vasta (Ed.), *Annals of Child Development* (pp. 187–248), Greenwich, CT: JAI.

To better interpret research findings and make more meaningful implication to real world setting, many researchers from adapted physical education/activity adopted the paradigm of the ecological model to organize literature of physical activity facilitators and barriers (Jaarsma et al., 2014a; Jaarsma et al., 2014b; Martin, 2013; van Schijndel-Speet, Evenhuis, van Wijck, van Empelen, & Echteld, 2014). Similarly for this paper, by adopting the notions of the ecological model, five predictors from sport commitment model and the additional four unique factors from the field of adapted physical activity can be roughly categorized into three levels: individual, social, and environmental corresponding with the notions of individual, microsystems, and mesosystems. The individual level represents intrapersonal factors that influence behaviors. The social level, as well as microsystems, involves the impact of significant others, and the environmental level (mesosystems) describes the attribution of physical and program accessibility. According to the nature of the SCM antecedents and the additional 4 antecedents acquired from the literature of adapted physical activity, sport enjoyment, personal investment, involvement opportunities, negative consequences of physical activity participation, and self-efficacy are the factors related to personal perceptions, feelings, prior experience that impact behaviors and decision making, so they belong to the individual level. The concepts of social constraints and social support are connected with the influence of external forces (e.g., parents, friends), so both of them are assigned to the social level. Involvement alternatives and accessibility reside in the environmental factors, which influence individual's psychological states and behaviors, so they are assigned to environmental level. (see Figure 2.4). Fusing the concept of Bronfenbrenner's ecological model with the SCM could provide for a more detail look at how sport commitment is impacted by the different sources/levels, and also could provide new knowledge to researchers, practitioners, and policy-makers to guide decision-making on where to intervene to most

meaningfully influence sport participation and continued commitment for enhanced quality of life and well-being in individuals with physical disabilities.

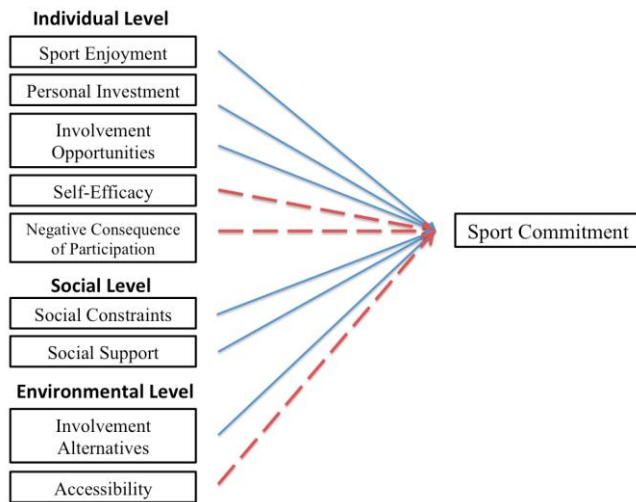


Figure 2.4 Extended Sport Commitment Model for Athletes with Disabilities. Solid lines represent the relationships between the original antecedents and sport commitment. Dash lines represent the relationships between the new antecedents and sport commitment.

Measurement and Analysis of Sport Commitment Model

Model constructs and the valence and significance of relationships between antecedents and commitment level have been tested since the SCM was developed. Sport enjoyment was found to be the strongest predictor of commitment, and also had moderate to strong correlations to other determinants (personal investment, involvement alternative, social constraints, and involvement opportunities) (Carpenter & Scanlan, 1998; Carpenter, Scanlan, Simons, & Lobel, 1993; Scanlan et al., 1993; Weiss et al., 2001). However, some inconsistent results appeared on the correlations between other predictors and commitment. For example, in Scanlan et al. (1993), involvement opportunities showed a significant correlation with sport commitment, but did not significantly

predict sport commitment. From a statistical perspective, Weiss et al. (2001) suspected that the effects of these constructs were suppressed by sport enjoyment, which may be mediating the influence of the other four antecedents on sport commitment. Hence, Weiss et al (2001) proposed two alternative models called the mediation model and direct/indirect model. The concept of the mediation model and direct/indirect model was similar to Baron and Kenny's (1986) complete and partial mediation. In the mediation model of sport commitment, sport enjoyment serves as a filter completely mediating the relationship between the other antecedents and level of sport commitment. As for the direct and indirect model, the impacts of the four antecedents not only would go through sport enjoyment to sport commitment, but also have direct influence on one's psychological state of desiring continued sport participation.

Structural equation modeling was the most common statistical technique used to compare the model fit between original, mediation, and direct/indirect models. In Weiss et al. (2001), they indicated that the direct/indirect model had better goodness-of-fit indices ($\chi^2 = 400.9$, RMSEA = .07, CFI = .91, NNFI = .90) than the other two models (original model, $\chi^2 = 400.9$, RMSEA = .07, CFI = .91, NNFI = .90; mediation model, $\chi^2 = 431.9$, RMSEA = .08, CFI = .90, NNFI = .89). Similar research findings were found by Choosakul, Vongjaturapat, Li, and Harmer, (2009). However, both of these studies failed to provide statistical evidence for deciding the superiority between models by conducting chi-square difference tests. Casper et al. (2007) had further examinations on three competing models by conducting chi-square difference tests. The results showed that even though the goodness-of-fit indices ($\chi^2 = 1738.91$, RMSEA = .08, CFI = .94, NNFI = .93) of direct/indirect model was better than the original model ($\chi^2 = 1655.35$, RMSEA = .08, CFI = .95, NNFI = .95), chi-square difference tests showed there was no difference between the two models. Such inconsistent results suggest that further examination of

the three models is needed.

Purpose, Research Question, and Hypothesis

Research has demonstrated the reliability and effectiveness of the SCM theoretical framework and the relevance of all five antecedents of the SCM in explaining one's desire and resolve for continued sport and exercise participation (Carpenter, 2001; Casper et al., 2007; Choosakul et al., 2009; Weiss & Weiss, 2007; Weiss et al., 2001). Although the antecedents of enjoyment, personal investment, and involvement opportunities appear to have potential impact on understanding and predicting sport commitment of athletes with disabilities, the influence of social constraints and involvement alternatives in this population still remain unclear. While this review highlighted and provided recommendations for examining each of the antecedents of sport commitment from the SCM individually, to fully understand how the antecedents fit with persons with disabilities, it is necessary to examine all the components of the SCM together. In addition, the four unique antecedents (self-efficacy, negative consequences of physical activity participation, social support, accessibility,) identified as possible contributors impacting one's desire and resolve for continued sport participation among persons with disabilities also need to be considered along with the antecedents from the SCM. Finding a parsimonious model, by adopting the concept of the ecological model, with five individual-level factors, two social-level factors, and two environmental-level factors is informative for theory development for future researchers to identify critical antecedents of sport commitment in athletes with disabilities, and also would be helpful for results interpretation and implication for disability sports programming (see Figure 2.5).

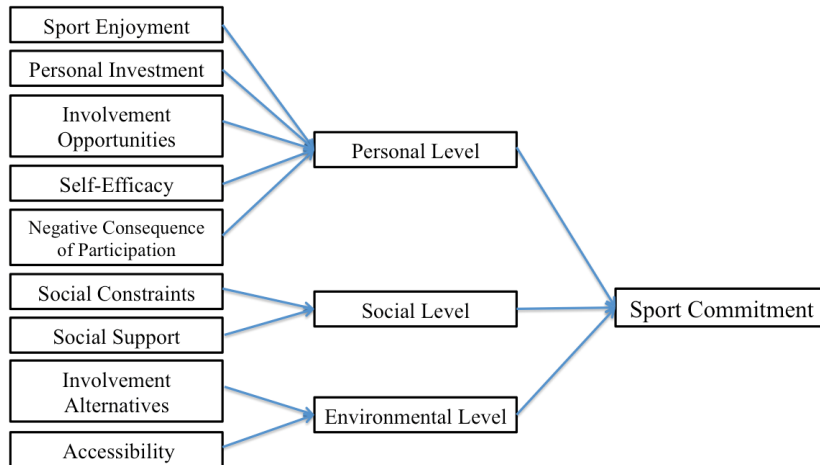


Figure 2.5 Conceptual Model of combining Sport Commitment Model with Ecological Model for Athletes with Disabilities.

Using the structure of the ecological model, the first purpose of this study was to examine the relationships between nine factors and sport commitment. The hypothesized direction of influence of each antecedent on sport commitment was that all the antecedents (sport enjoyment, personal investment, involvement opportunities, self-efficacy, social support, involvement alternatives) would have positive relationships with sport commitment. Negative relationships were hypothesized to exist between consequences of sport participation, social constraints, and accessibility of sport facilities and settings with sport commitment.

From an applied perspective, understanding the impact of alternative models can be used for designing programs and trainings to facilitate long-term sport and physical activity participation for individuals with disabilities through which people with disabilities can enhance their quality of life. The second purpose of this study was to investigate the parsimony among the original model, mediation model, and direct/indirect model by incorporating the notion of ecological model. In the mediation model, the impact of personal, social, environmental level on sport

commitment completely mediated by sport enjoyment was examined (see Figure 2.6). In the direct/indirect model, not only the relationships mentioned in the mediation model were examined, but also the correlations between personal, social, and environmental levels and sport commitment (see Figure 2.7). Due to lack of research findings and little information, no hypothesis was proposed for which model best fits our understanding of the mediators of sport commitment for persons with disabilities. However, from a measurement perspective, by adding more parameters in the mediation and direct/indirect models, it was hypothesized that the direct/indirect models would have better model fit than the mediation and original model, and mediation model would have better model fit than the original model.

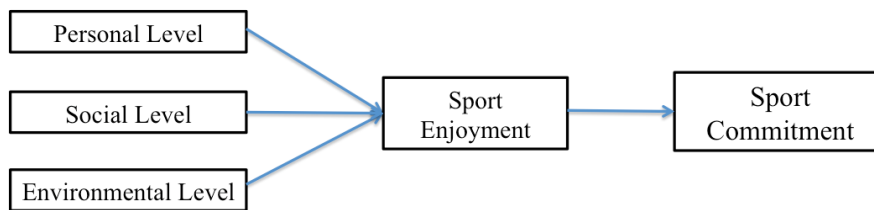


Figure 2.6 Conceptual Model of combining Mediation Model with Ecological Model for Athletes with Disabilities.

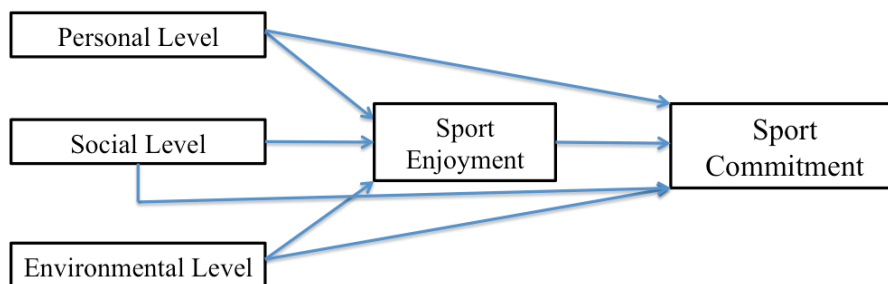


Figure 2.7 Conceptual Model of combining Direct/Indirect Model with Ecological Model for

Athletes with Disabilities.

Methods

Participants

A total of 200 adult athletes with physical disabilities participating in team and individual sports across the United States, Europe, and Asia were expected to be recruited to participate in this study. Soper's (2016) A-priori Sample Size Calculator for SEM was used to ensure the sample size of 200 would provide adequate power to detect a medium effect size using 10 latent variables (exogenous variables: sport enjoyment, personal investment, involvement opportunities, self-efficacy, social support, involvement alternatives, negative consequences of sport participation, self-efficacy, social support, accessibility of sport facilities and settings; endogenous variable: sport commitment). Also, Kline (2011) and Weston and Gore (2006) recommended a minimum sample size of 200 be used for any Structural Equation Modeling. Four inclusion criteria were used to recruit participants. First, participants were aged 18 or older. Second, participants must be fluent in English. Third, participants must have had at least one year of sport competition or tournament play experience that included regular training and pre-, in-, and post-season at any level (e.g., community level, collegiate level, state-wide level, international level). Lastly, participants must have had a physical disability, which includes impairment caused by congenital anomaly (e.g., absence of some member), disease (e.g., bone tuberculosis), and from other causes (e.g., amputation, cerebral palsy). To ensure that participants fully comprehend the survey questions, individuals with intellectual disabilities were not recruited for this study.

Participant Recruitment

Due to the challenge of recruiting a large sample size of athletes with physical disabilities, two approaches were used. First, two non-probability sampling methods (convenience sampling and snowball sampling) were used to generate the sample for this study. Second, personal communications (email and phone) as well as posting on social media (e.g., Facebook) were used to share with coaches, colleges, and sport governing organizations (e.g., BlazeSports, AAASP, National Wheelchair Basketball Association, etc.) for help disseminating the information of this study and recruiting participants.

Interested athletes with physical disabilities were directed to a link with an electronic survey through the information printed on recruitment posting and included in email solicitations. The online survey included the IRB approved informed consent, study purpose, instruction for questionnaire completion, demographic information, and measurements corresponding to the purpose of the study. The estimated data collection period was 10 weeks. Every 2 to 3 weeks, the PI contacted all the co-workers through email, phone, or in-person meetings and requested that they assist with frequent reminder emails to their constituents to complete the questionnaire.

Instrument Development

The PI developed items corresponding to the two antecedents (negative consequence of sport participation) and accessibility of sport facilities and settings. These new scales for negative consequence of sport participation and accessibility of sport facilities and settings were developed using the same format as those currently existing for the other antecedents in the SCM. The scores of these two scales were validated using a two-step content validation process. In phase one, a panel of three experienced researchers expert in the field of sport and exercise psychology and adapted physical education/activity and two athletes with physical disabilities were invited to evaluate the item pool for both antecedents in order to verify that all the items

reflected their respective construct and purpose of this study. A rating form (see Appendix A) for evaluating the items for both scales was sent to all invited experts to record comments and feedback. After retrieving comments and ratings from the experts, the PI revised or deleted questionable items or added new items based on the degree of consensus. In phase two, three additional individuals with disabilities scrutinized the items to make sure they understood the meaning of the items. After these two phases of validation, a final list of items was selected for inclusion in the sport commitment model questionnaire.

Measures

Demographic Questionnaire. Participants completed questions regarding their gender, age, disability type, severity of disability, age at onset of disability, years of participation, level of participation, number of sports played, and length of time they have participated in their selected sports (see Appendix B).

Sport Commitment Questionnaire (SCQ). The sport commitment model questionnaire developed by Scanlan et al. (1993) and Scanlan, Chow, Sousa, Scanlan, and Knifsend (2016) included a total of 25 items to assess the perception of sport commitment, sport enjoyment, personal investment, involvement opportunities, social constraints, and involvement alternatives of athlete with physical disabilities (see Appendix C). All items were answered on a 5-point Likert scale, ranging from 1 (“not at all”) to 5 (“very much”). Four items were used to assess sport commitment. An example item was, “How hard would it be for you to quit (program)?” A total of 5 questions addressed sport enjoyment. An example question was, “Playing this sport is fun?” The measurement for personal investment had 3 questions. An example item was, “How much of your time have you put into playing in (program) this season?” Involvement opportunities were assessed by 4 statements. An example statement was, “I would really miss the

things I learn in this sport if I didn't play?" Social constraints were measured by 4 questions. An example question was, "People would be upset if I didn't keep playing this sport because they have invested so much." Five items were used to assess involvement alternatives. An example item was, "Other things in my life make it difficult to play this sport?" All the items were averaged to represent each construct.

Sport Self-Efficacy Scale (SSES). The SSES was a modification of the exercise self-efficacy scale, developed by Kroll, Kehn, Ho, and Groah (2007). The exercise version was constructed to assess confidence of persons with a spinal cord injury (SCI) to engage in exercise (see Appendix D). For purposes of the present study, references to exercise were replaced with the word sport, with a corresponding change to the acronym from exercise to sport self-efficacy scale. The exercise version of this instrument was confirmed as reliable with high internal consistency. In addition, construct validity, revealed all items having a statistically significant correlation with a generalized self-efficacy scale. A total of 10 statements were used to measure the construct of the SSES. All items had the following stem: "I am confident..." Sample questions included "that I can overcome barriers and challenges with regard to sport if I try hard enough" and "that I can find means and ways to participate in sport." After averaging individual items, a final score was used to represent its subscale. All the items were answered on a 4-point Likert scale, ranging from 1 ("not at all true") to 4 (always true).

Negative Consequences of Sport Participation (NCSP). Based on the research literature (Buffart, Westendorp, van den Berg-Emos, Stam, & Roebroek, 2009; Jaarsma et al., 2014a, 2014b; Martin, 2013), the most commonly found negative impacts from exercise and sport participation in persons with disabilities were identified. A total of 7 items were used with the stem "Participating in sport" to assess the negative consequence of participation by using a

5-point Likert scale, ranging from 1 (“strongly disagree”) to 5 (“strongly agree”) (see Appendix E). Sample items included “Is too dangerous for me”, “Results in muscle pain”, “Makes me feel fatigued”, “Makes me feel vulnerable to an injury.” A high score on this scale represented an individual who perceives more negative outcomes from his/her sport participation than positive benefits.

Social Support Scale (SSS). Two types of social support, identified, developed, and measured by Scanlan et al. (2016), were assessed: emotional and informational (see Appendix F). A total of 4 items were used to assess social support-emotional. Sample questions included “People who are important to me attend the majority of my competition in this sport” and People who are important to me are there for me after I perform poorly in this sport.” Social support-informational were measured by 5 statements. Sample statements were, “People who are important to me teach me the strategies of this sport” and “People give me trustworthy advice about this sport.” A 5-point Likert scale, ranging from 1 (“strongly disagree”) to 5 (“strongly agree”), was used for all the items.

Accessibility of Sport Facility and Settings (ASFS). According to past research findings of exercise and sport barriers for people with disabilities (Buffart et al., 2009; Jaarsma et al., 2014a, 2014b; Martin, 2013) and suggestions from the current study panel of experts, a total of 11 items, with a 5-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”), were developed to assess the perception of sport accessibility for athletes with physical disabilities (see Appendix G). All items had the following stem: “I feel...”. Sample items were “There are too few sport facilities for me to choose from”, “Sport equipment is too expensive”, “There are too few sport programs available to me”, and “Most sport facilities are not safe for me.”

Data Analysis

Statistic Package for the Social Science (SPSS) software version 21.0 was used to organize the dataset and run descriptive analysis (e.g., mean, standard deviation, kurtosis, skewness, outliers) and internal reliability tests to ensure the data have good structure and were suitable for further analyses.

Structural equation modeling was conducted to answer the research questions, and LISREL 8.0 was used to analyze the data. A total of four goodness-of-fit indices, two absolute indices (χ^2 and SRMR), a parsimonious index (RMSEA), and an incremental index (CFI), were used to evaluate model fit. Absolute indices evaluated the overall discrepancy between observed and model-implied variances. Parsimonious indices evaluated the model's simplicity while comparing two or more models. Incremental index evaluated a model's absolute fit relative to a baseline model. According to Hu and Bentler (1999), the suggested values to retain a model were as follow: $SRMR \leq .08$, $RMSEA \leq .06$, and $CFI \geq .95$.

To test the first study hypothesis of how nine antecedents influence sport commitment, CFA measurement model was used to examine how well the items explained their respective latent variables (enjoyment, personal investment, involvement opportunities, self-efficacy, negative consequence of participation, social constraints, social support, involvement alternatives, accessibility, sport commitment). If the measurement model was rejected, reasonable modification was employed by considering the suggestions from LISREL software, theory, and past research findings. Once the goodness-of-fit indices of the measurement model were acceptable after modification, structural model (baseline model) was used to examine the model fit of how the nine antecedents influence sport commitment. Given the information of the baseline model, multilevel SEM was employed to examine a model of how sport commitment was impacted by second level variables: individual level, social level, and environment level, and

also of how second level variables were being explained by their corresponding factors.

To examine the second study hypothesis of determining parsimonious model, three competing models (original model, mediation model, direct/indirect model) were tested to see which one was more theoretically plausible. A simpler model (original model) had fewer parameters, bigger degree of freedom (df), and a larger chi-square value; in contrast, a more complicated model (mediation model and direct/indirect model) had more parameters, smaller df, and a smaller chi-square value. Since the original model was not nested within the direct/indirect model, Chi-square difference tests was only utilized to examine statistical significance of the decrement in the chi-square value between the mediation and direct/indirect models. If the chi-square difference test showed no significant differences between mediation and direct/indirect models, the mediation model was used to compare with the original model. If the chi-square difference test was significant, the more complicated model (direct/indirect model) was deemed to fit better than the mediation model and it was used to compare with the original model.

Results

Description of Participants

Responses were obtained from 164 athletes ($n = 115$ males; $n = 49$ females) with physical disabilities ranging in age from 18 to 68 years ($M = 34.87$, $SD = 11.78$) from the United States (86%) and other English-speaking countries (14%; United Kingdom, Australia, and Malaysia). Combined athletes represented 23 team and individual sports. About 94% of athletes ($n = 154$) participated in one sport, and 6% of participants ($n = 10$) played more than two sports. The average length of participation in para-sports was 8.66 years ($SD = 7.93$). Demographics of participants including disability classification, severity of disability, specific sports engaged in by participants, ethnicity, and level of competition is summarized in table 2.1.

Table 2.1 Participants Characteristics

Demographic Variables	Percentage
Gender	
Male	70%
Female	30%
Disability	
Spinal Cord Injury	42%
Spina Bifida	12.8%
Amputee	12.2%
Cerebral Palsy	10.9%
Multiple Disabilities	5.5%
Others (e.g., traumatic brain injury, dwarfism, Nagers Syndrome)	16.5%
Severity of Disability	
Mild	15.9%
Moderate	48.8%
Severe	29.3%
Profound	6/1%
Ethnicity	
White or Caucasian	74.8%
Black or African American	8.6%
Hispanic or Latino	6.7%
Asian	2.5%
Native Hawaiian or Pacific Islander	0.6%
Multiracial	4.0%
Others	1.8%
Sports	
Wheelchair Basketball	50%
Wheelchair Rugby	7.37%
Table Tennis	6.09%
Body Building	5.48%
Swimming	4.62%
Track and Field	4.62%
Cycling	2.43%

Others (e.g., triathlon, soccer, tennis, shooting)	6%
Level of Participation	
Community Level	8.5%
Regional Level	11.6%
State-wide Level	6.7%
National Level	48.2%
International Level	23.2%
Degree of Perceived Competitiveness	
Very Competitive	51.5%
Competitive	39.3%
Sort of Competitive	6.7%
A Little Competitive	2.4%
Not At All Competitive	0%

Internal Consistency

All instruments (SCQ, SSES, NCSP, SSS, ASFS) and subscales indicated acceptable internal consistency with Cronbach's alpha between .76 and .90 with the exception of the sport commitment and personal investment sub-scales of the SCQ (see Table 2.1). SPSS results indicated that item 1 ($r = -.35 - -.38$) from the sport commitment subscale and item 3 ($r = .19 - .29$) on the personal investment subscales of the SEQ had poor correlations (Tabachnick & Fidell, 2007) with other sport commitment and personal investment items, respectively. When both items were deleted, the internal consistency of sport commitment and personal investment sub-scales became acceptable (Tabachnick & Fidell, 2007) (see Table 2.2).

Test for Normality

Kline (2011) recommended that the absolute value of skewness be less than 3 and kurtosis

less than 10. All variables (sport commitment, personal investment, involvement opportunities, social constraints, involvement alternatives, self-efficacy, negative consequences of sport participation, social support, accessibility of sport facilities and settings) were within acceptable range (skewness = -1.34 – .11; kurtosis = - .61 – 1.80) except enjoyment (skewness = -3.56; kurtosis = 18.43) (see Table 2.3).

Table 2.2 Scale Reliabilities and Correlations

Variables	1	2	3	4	5	6	7	8	9	α
1. Commitment										.83
2. Enjoyment	.37**									.86
3. Personal Investment	.42**	.20**								.87
4. Involvement Opportunities	.57**	.33**	.14							.77
5. Social Constraints	.38**	.23**	.22**	.44**						.76
6. Involvement Alternatives	-.24**	-.17*	-.38**	-.09	-.07					.90
7. Sport Self-Efficacy	.21**	.20*	.42**	.19*	.21**	-.29**				.76
8. Negative Consequences	-.05	-.19*	-.12	.01	.01	.11	-.15			.79
9. Social Support	.13	.18*	.09	.16*	.22**	-.10	.11	-.04		.90
10. Accessibility	-.03	-.05	-.17*	.06	-.05	.26**	-.26**	.15	-.12	.77

*correlation is significant at 0.05 level (2-tailed).

**correlation is significant at 0.01 level (2-tailed).

Pearson Correlation

Bivariate Pearson correlation was conducted to examine the relationships among variables. All significant correlations met the theoretical assumptions. Sport commitment had significantly low to medium and positive correlations ($r = .21 - .57$) with sport enjoyment, personal investment, involvement opportunities, social constraints, and self-efficacy, and had significantly low and negative correlation with involvement alternatives ($r = -.21$). With the exception of negative consequence of sport participation and social support subscales, self-efficacy had significantly low to medium and positive correlations with enjoyment, personal investment,

involvement opportunities, and social constraints ($r = .19 - .42$), and had significantly low and negative correlations with involvement alternatives and accessibility of sport facilities and settings ($r = -.29$ and $-.26$). Social support only indicated low and positive correlations with enjoyment, involvement opportunities, and social constraints ($r = .18 - .22$). Negative consequence of sport participation only had a significant, but negative, correlation with enjoyment ($r = -.19$). Last, accessibility of sport facilities and settings was significantly and positively correlated with involvement alternatives ($r = .26$), and was negatively correlated with personal investment and self-efficacy ($r = -.17$ and $-.26$) (see Table 2.2).

Test for Multicollinearity

Regression diagnostic procedure, built into the SPSS software, was used to detect multicollinearity among the ten variables. Variance inflation factor (VIF), no bigger than 10, and tolerance, no smaller than .1, were used as two indicators to examine multicollinearity among the variables (Tabachnick & Fidell, 2007). Results showed that all the values of VIF and tolerance values were in the acceptable range (VIF = 1.09 – 1.91; tolerance = .52 – .93) (see Table 2.2).

Table 2.3 Descriptive and Multicollinearity Analysis

Variables	Mean	SD	Skewness	Kurtosis	Tolerance	VIF
1. Commitment	4.31	.72	-1.27	1.71	.52	1.91
2. Enjoyment	4.78	.46	-3.56	18.43	.80	1.25
3. Personal Investment	4.15	.86	-1.17	1.80	.64	1.57
4. Involvement Opportunities	4.51	.59	-1.34	1.35	.59	1.71
5. Social Constraints	3.64	.83	-.50	-.01	.74	1.36
6. Involvement Alternatives	3.09	1.08	-.26	-.61	.78	1.28
7. Sport Self-Efficacy	3.33	.43	-1.16	4.13	.74	1.36
8. Negative Consequences	2.85	.80	.11	-.35	.93	1.08
9. Social Support	3.92	.84	-.89	.51	.92	1.09
10. Accessibility	2.50	.80	-.12	-.16	.86	1.16

Confirmatory Factor Analysis and Psychometric Properties

With the removal of two items one from each of the sport commitment and personal investment sub-scales, a total of 60 items across 10 latent variables were used to run the CFA model. LISREL output showed two warnings of “Sample size is too small to compute” and “Matrix is not positive definite.” There are various reasons to cause warnings of a matrix problem, including linear dependency, outliers, typographical errors, missing values, and small sample size. After data screening, multicollinearity test showed there were no linear dependency issues among the variables, and demographic examination indicated no outliers and typographical errors. Additionally, Robust Maximum Likelihood was employed as default setting to address the non-normality caused by the enjoyment subscale. Moreover, there were seven incomplete questionnaires. Although Full Information Maximum Likelihood (FIML) estimation technique was used to address missing values for SEM analysis, the warning of non-positive-definite matrix existed. Hence, to eliminate the effect of missing values, the seven cases were removed leaving a final sample of 157 participants for further data analyses. Three steps were conducted to address the matrix issue that may be caused by low sample size. First, bootstrapping technique was used to search for more sampling variation by repeatedly sampling from the data collected in this study (Nevitt & Hancock, 2001). However, the matrix issue still existed. Parceling, a second approach, was employed to reduce the parameters estimated by LISREL. The concept of parceling was to make nine level-one latent variables (sport enjoyment, personal investment, involvement opportunities, social constraints, involvement alternatives, self-efficacy, negative consequences of sport participation, social support, accessibility of sport facilities and settings) as observed variables by calculating the means of a set of items and to make three level-two latent variables

(personal, social, and environmental level) as level-one latent variables. Although the sample size problem had been fixed, a non-positive-definite matrix remained. A third approach examined two CFA models by dividing 9 latent variables into two models: original SCM model with variables of sport enjoyment, personal investment, involvement opportunities, social constraints, and involvement alternatives, and the new SCM model with variables of self-efficacy, negative consequences of sport participation, social support, and accessibility of sport facilities and settings. Results of CFA of the original SCM model showed all goodness-of-fit indices at a satisfactory level (χ^2 (215) = 384.59; RMSEA = .07; CFI = .95; SRMR = .06) based on Hu and Bentler's (1999) suggested criteria. In accordance with the suggestions of Steven (1992), using a cutoff of .4 for factor loading led to the removal of 8 items with low factor loadings from the new SCM CFA model; four items from the SSES (SE7, SE8, SE9, SE10), three items (NC1, NC2, NC7) from NCSP, and one item (AC6) from ASFA from further analyses. The new SCM CFA model showed the goodness-of-fit indices at a satisfactory level (χ^2 (583) = 995.92; RMSEA = .06; CFI = .95; SRMR = .05).

The remaining 52 items were pulled together to re-run a full-item CFA model and parceling model to check if the warnings of small sample size and non-positive-definite matrix were present. Results indicated that the issues of small sample size and non-positive-definite matrix had not been resolved. Hence, the decision was made to continue adopting and examining the approach of dividing the original and new SCM models respectively.

Sport Commitment Model

The structural model of the original SCM, testing the relationships between the original five antecedents (sport enjoyment, personal investment, involvement opportunities, social constraints, and involvement alternatives) and sport commitment, had acceptable goodness-of-fit indices (χ^2

(215) = 384.95; RMSEA = .07; CFI = .95; SRMR = .06) (see Figure 2.8). Sport commitment was explained 66% of variance by personal investment and involvement opportunities with medium to large effect size (path coefficient = .36 and path coefficient = .58). Acceptable goodness-of-fit indices (χ^2 (583) = 995.92; RMSEA = .06; CFI = .95; SRMR = .05) were also found in the structural model of the new SCM, the relationships between the new proposed antecedents (self-efficacy, negative consequences of sport participation, social support, and accessibility of sport facilities and settings) and sport commitment. However, none of these latter exogenous variables significantly explained the variance of sport commitment and were removed from further analyses.

Mediation Model and Direct/Indirect Model.

The original purpose of fusing the three levels of the Ecological model with SCM was to simplify the effect of the new theoretical model for the study of applied and scholarly investigations involving sport commitment in athletes with physical disabilities. However, due to the issues of non-positive-definite matrix of the dataset and no contributions of the newly proposed variables to understanding sport commitment, categorizing the original five variables of the SCM into three levels of the ecological model was deemed unnecessary.

Mediation model. Results showed that two (CFI = .92; SRMR = .11) of the goodness-of-fit indices did not meet Hu and Bentler's (1999) suggested criteria. According to the suggestion of modification indices, four reasonable modifications, covarying the errors (SC1 and SC2, IA1 and IA2, Enj4 and Enj5) within an observed variable, were made to achieve acceptable model fit (χ^2 (215) = 390.55; RMSEA = .06; CFI = .95; SRMR = .11) (see Figure 2.9). A total of 20% of the variance of sport commitment was explained by enjoyment with medium effect size (path coefficient = .46). Twenty percent of explained variance in enjoyment was by involvement

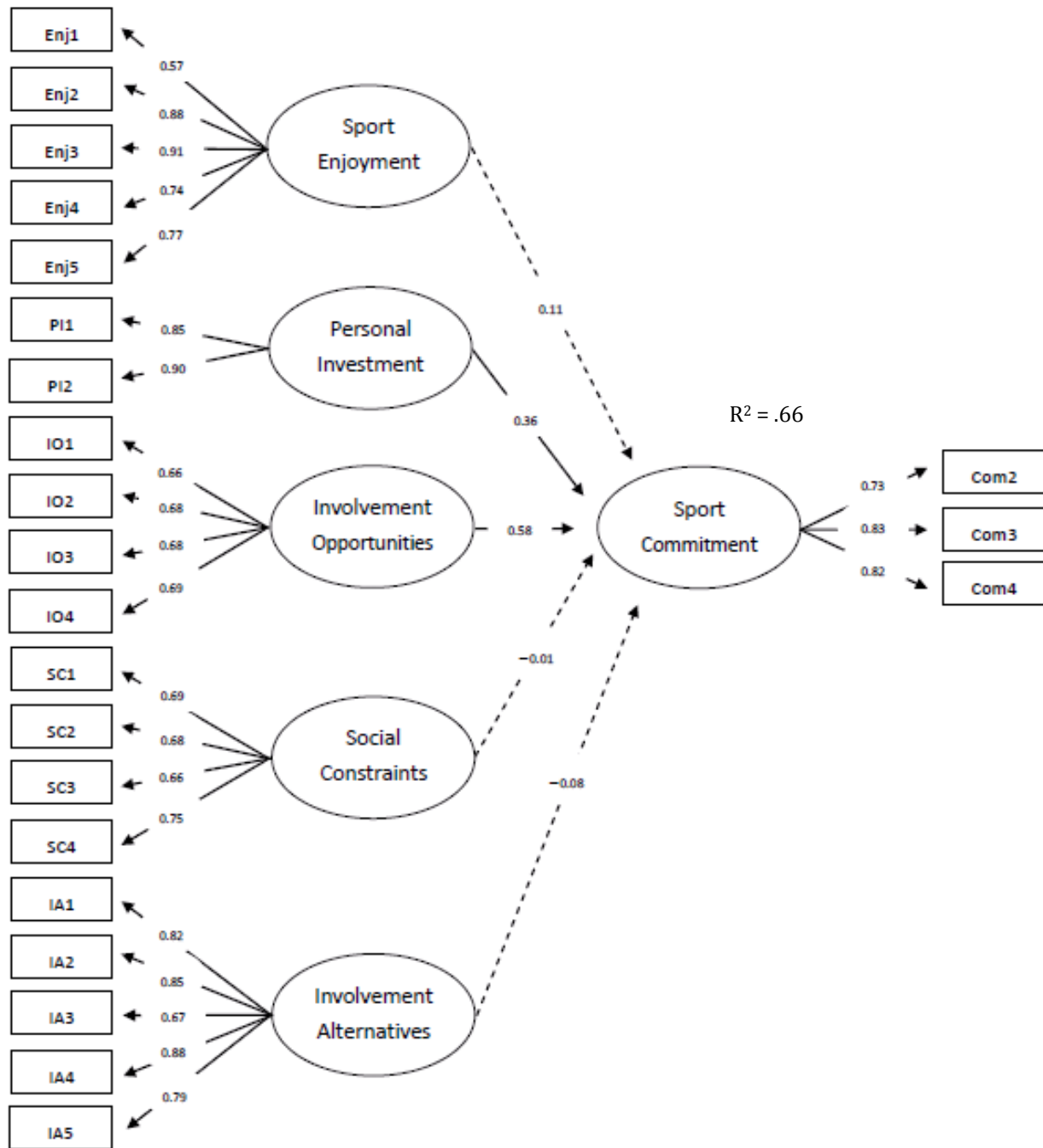
opportunities with small effect size (path coefficient = .27), and the paths of personal investment, social constraints, and involvement alternatives to enjoyment were found to be non-significant.

Direct/Indirect Model. All the goodness-of-fit indices indicated that the direct/indirect model had acceptable model fit (χ^2 (211) = 318.41; RMSEA = .05; CFI = .97; SRMR = .06) (see Figure 2.10) Involvement opportunities (path coefficient = .36), followed by personal investment (path coefficient = .57), were the strongest predictors of sport commitment (R^2 = .65). Enjoyment, social constraints, involvement alternatives were not significant predictors of sport commitment. When examining the path to enjoyment, involvement opportunities was the only significant predictor of enjoyment (R^2 = .18; path coefficient = .25).

Model Comparison. Because the mediation model was nested within the direct/indirect model, a chi-square difference test was used to compare both models. Results indicated the chi-square of the direct/indirect model was significantly reduced (p = .00), suggesting that direct/indirect model had better model fit than the mediation model. Goodness-of-fit statistics are shown in Table 2.4.

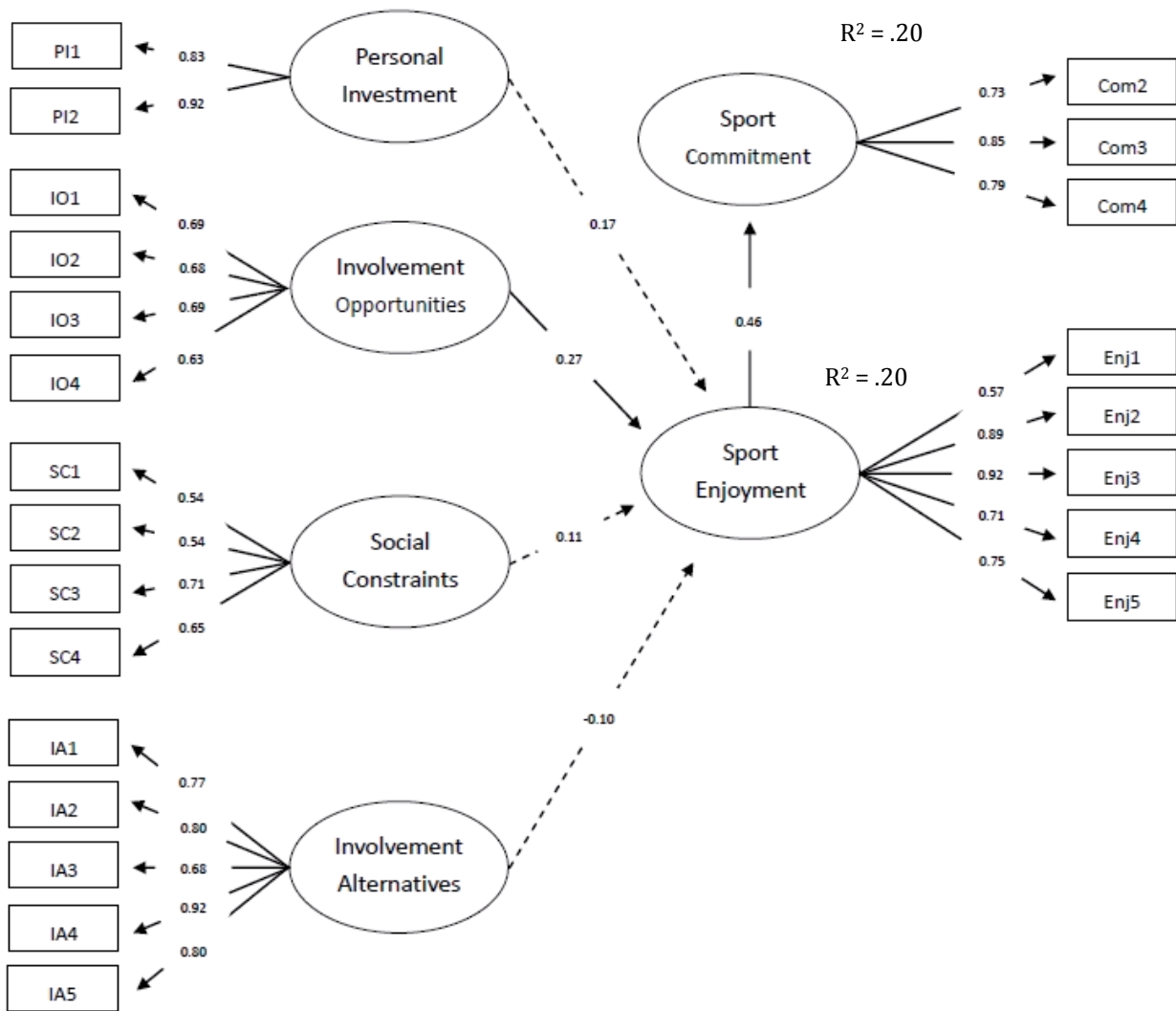
Table 2.4 Goodness-of-Fit Statistics

Models	χ^2	df	RMSEA	CFI	SRMR	AIC
The Original SCM	384.95	215	.07	.95	.06	492.43
Medication Model	390.55	215	.06	.95	.11	474.19
Direct/Indirect Model	318.41	211	.05	.96	.06	422.35



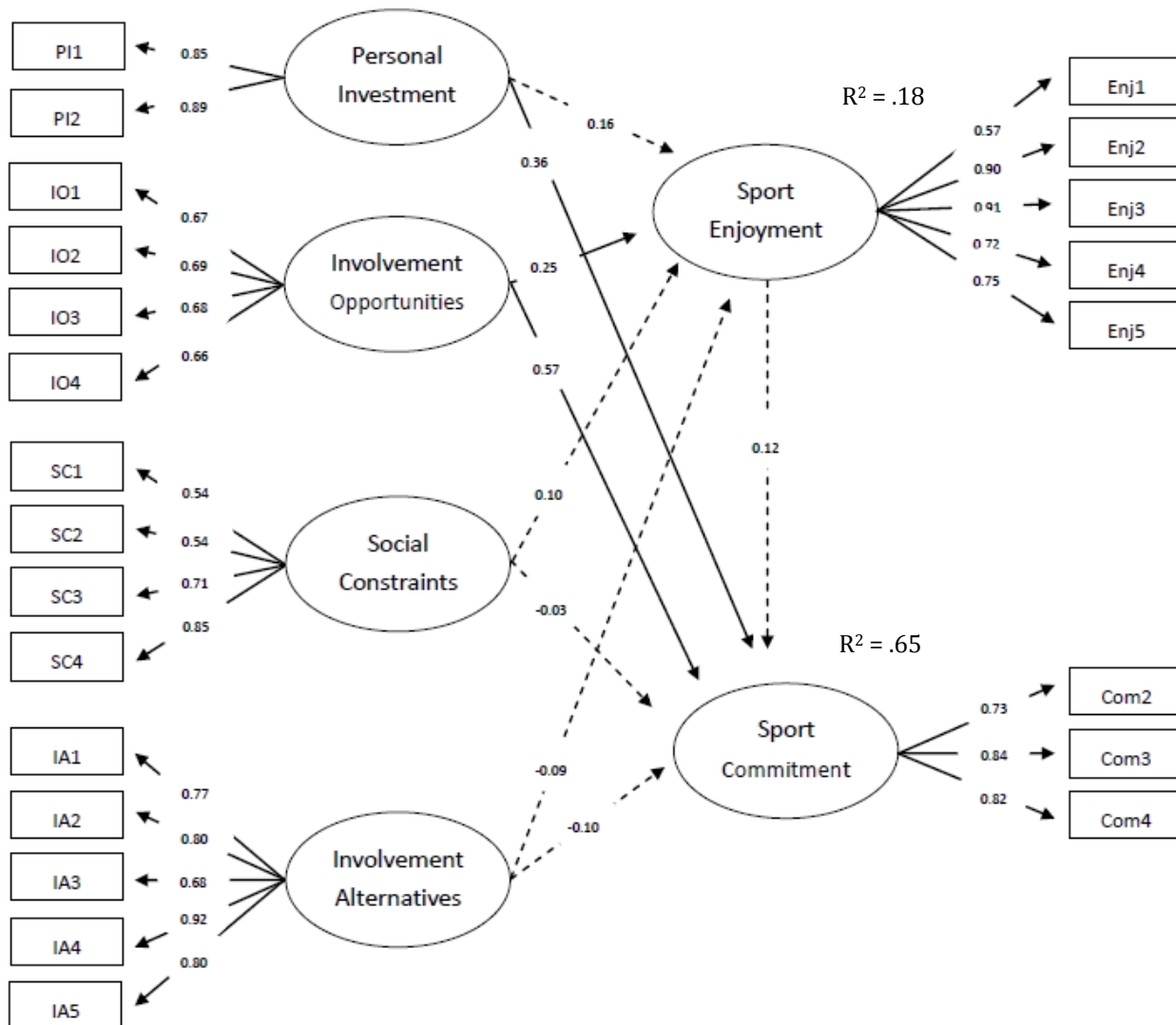
Note: Dashed lines represent non-significant paths/loadings.

Figure 2.8 Original sport commitment model with standardized parameter estimates.



Note: Dashed lines represent non-significant paths/loadings.

Figure 2.9 Mediation influences of sport commitment model with standardized parameter estimates.



Note: Dashed lines represent non-significant paths/loadings.

Figure 2.10 Direct/indirect influences of sport commitment model with standardized parameter estimates.

Discussion

Using an ecological model framework, the primary purpose of this study was to examine the relationships between nine antecedents, five from the original SCM (sport enjoyment, personal investment, involvement opportunities, self-efficacy, social support, involvement alternatives) and four unique factors (consequences of sport participation, social constraints, accessibility of sport facilities and settings) on sport commitment of athletes with physical disabilities. The following discussion addresses the contribution of each of these nine antecedents to understanding sport commitment among individuals with physical disabilities.

The Original Sport Commitment Model. Of the five factors (enjoyment, personal investment, involvement opportunities, social constraints, and involvement alternatives) hypothesized to have a significant impact on sport commitment only involvement opportunities and personal investment were significant predictors of sport commitment for athletes with disabilities in the present study. Involvement opportunities has been found to be a major predictor of sport commitment in athletes with disabilities, and is consistent with the findings of Casper, Gray and Stellino (2007) Guillet, Sarrazin, Carpenter, Trouilloud, and Cury (2002), and Weiss and Weiss (2007) that, compared with athletes without disabilities, involvement opportunities appear to be equally important to athletes with disabilities. The present findings, further align with the viewpoint of Scanlan and colleagues (1993) that elite athletes, like that of 70% of participants in the current study who were competing at national and international level sport tournaments, appear to value and anticipate more benefits and opportunities gained from their continued sport participation than those who compete at lower-level of competition.

With regard to the personal investment subscale, not only has the relationship between personal investment and sport commitment in individuals with disabilities been confirmed in the

present study, but also its importance as a secondary contributor of sport commitment prediction was also identified. Shields, Synnot, and Kearns (2014) and Littman et al. (2014) similarly found that individuals with disabilities, compared with those without disabilities, tend to value their financial resources and may make their investment in their sport participation count. Additionally, the current findings support the viewpoint of Kurková and Nemček (2016) that the time investment of individuals with disabilities in physical activity could lead to sustained PA participation.

While enjoyment was significantly correlated with sport commitment in the present study, it failed to be a significant prediction on sport commitment for athletes with physical disabilities. According to the literature, enjoyment was the most common significant predictor of sport commitment in athletes without disabilities (Scanlan, Russell, Beals, & Scanlan, 2003; Scanlan, Russell, Magyar, & Scanlan, 2009), as well as for those with disabilities (Martin, 2006; Wilhite, Martin, & Shank, 2016). A possible explanations for the differential role of enjoyment between the present findings and those previously reported may reflect differences in motive for sport compared to physical activity participation. Athletes with physical disabilities may be more task-oriented than emotion-oriented. Based on the findings of Yao, Shapiro, and Liao (2016), for individuals with physical disabilities, the top priority of participating in physical activity was to improve personal fitness and sport-related skills with positive emotion (e.g., enjoyment) playing a secondary role in participant motivation. This viewpoint is supported by Allender, Cowburn, and Foster (2006), who indicated that although enjoyment was a common reason for being physically active among adults without disabilities, skill development was the main reason of sport engagement. Furthermore, the findings of Welty Peachey, Cunningham, Lyras, Cohen, and Bruening (2014) indicated that skill development was the second most influential motivator in

the adult elite sport environment followed by interpersonal connections. Hence, participants in the present study, like those of adults without disabilities in the above cited research appeared to prioritize skill improvement and performance over enjoyment. However, it does not mean that enjoyment is not important to the elite athletes with disabilities. Sport commitment can be impacted by enjoyment, as long as the needs of and motives for sport participation of athletes with physical disabilities are met. It is likely, that demonstrating competence and outperforming others at national and international competitions provides athletes with a sense of enjoyment. The role of enjoyment, at the level of elite athletes with disabilities, may play a mediating role filtering the effects of other antecedents.

The lack of a significant contribution of social constraints to understanding sport commitment for athletes with disabilities in the present study is consistent with the findings of Eng and Martin Ginis (2007) and Kosma et al (2009) who reported that social constraints, a similar concept to subject norms in the theory of planned behavior, had no significant effect on the sport commitment of adult athletes with disabilities. Significant others appear to have less influence on adult athletes with physical disabilities than on children and youth athletes with disabilities (Swanson, Colwell, & Zhao, 2008). Adult elite athletes with disabilities have clear goals and high autonomy and independence on their sport participation (Martin, 2015) so they may not rely on the social expectations, norms, and external pressure to continue their sport participation. On the other hand, since Jeong, Kim, and Lee (2015) have found the impact of subjective norms on children with disabilities who, relative to adults, have lower levels of autonomy and self-regulation, it suggests that the social constraints may have a greater influence on children and youth with disabilities and thus should not be disregarded as an influential antecedent in sport commitment of children and youth with disabilities.

Involvement alternatives also showed no predictive value on sport commitment. Given that less than 10% of the participants in the present study trained in and/or competed in multiple sports, suggests that consistent with the findings of Scanlan et al. (1993), elite athletes with disabilities, like those without disabilities, tend to commit internal resources (e.g., time) to their primary sport. As previously discussed, financial resources tend to be more limited for people with disabilities reducing the resources available to commit to multiple sports (Jaarsma et al., 2014; Kars et al., 2009). Involvement alternatives, like social constraints appear not as influential a factor impacting the desire and resolve of continued sport participation of adult elite athletes with physical disabilities as hypothesized in the SCM. However, the effect of involvement alternatives may still be influential in understanding sport commitment among children and youth with disabilities. For children and youth, involvement alternative might play a role negatively influencing sport commitment while they explore multiple sports until they find the one they like most or want to dedicate their time to. Further examination of the differential effects of social constraints and involvement alternatives between children, youth, and adults with disabilities is needed in the future to more fully understand the impact of these constructs on sport commitment in athletes with disabilities.

The Unique Sport Commitment Model Variables. The new four predictors of sport commitment including, negative consequences of sport participation, self-efficacy, social support, and accessibility of sport facilities and settings, were not significant in predicting sport commitment. The physical and psychological consequences (e.g., physical pain, excessive fatigue, frustration) of sport participation did not significantly and negatively impact athletes with physical disabilities desire and resolve for continued sport participation. One possible explanation of why there was no effect of negative consequences of sport participation on sport commitment

could be that the recruited participants were elite athletes, who might possess high level of mental toughness. According to Martin (2015), since elite disability sport settings are increasingly competitive, elite athletes with disabilities are required to be mentally tough to engage in high level competition. Weinberg, Freysinger, Mellano, and Brookhouse, (2016) pointed out that mental toughness could increase one's psychological and physical endurance and resilience to cope with challenging circumstances in sport settings. Jones, Hanton, and Conaughton (2002) and Levy, Polman, Clough, Marchant, and Earle (2006) found that possessing this psychological trait can help athletes deal with negative consequences (e.g., tiredness, injury, muscle pain) following training and sport participation. Based on these findings, a mentally tough individual tends to see these challenges and adversities as an opportunity and not a treat. Thus, for the current sample, negative consequence of sport participation may not cause a problem to discourage their continued sport participation.

Since self-efficacy approached acceptable levels of statistical significance, the finding of self-efficacy suggested that it might still play an important role, same as previous results (Heller, Ying, Rimmer, & Marks, 2002; Henderson & Bedini, 1995; Malone, Barfield, & Brasher, 2012; Shields & Synnot, 2014), in positively impacting continued sport participation for athletes with physical disabilities. Because this study failed to achieve the desired sample size, it did not meet required statistical power and the probability of making a type II error may occur. That is, when statistical power is low, the present study may not be able to detect the effect of self-efficacy on sport commitment and our findings on self-efficacy may retain a false null hypothesis (Tabachnick & Fidell, 2007). It is highly probable that when the sample size and power is large enough, a significant relationship between self-efficacy and sport commitment may be observed.

Validity of the items measuring self-efficacy also may be another explanation for the lack of

significance between self-efficacy and sport commitment. The present sport self-efficacy scale was modified from an exercise self-efficacy scale. The references of exercise and physical activity were replaced with the word sport. This action may change the meanings of the items, or it may be, the items were not designed to reflect the sport settings. Hence, the scale may not have effectively measured the concept of self-efficacy in sport settings for athletes with disabilities. Moreover, from confirmatory factor analysis in this study, four items were deleted due to low factor loading. It may indicate the modified items did not properly reflect the self-efficacy in the sport settings for athletes with physical disabilities. Caution should be used when converting the words exercise or physical activity to sport to ensure their meaning is similar.

The antecedent of social support might be not as important as other variables (personal investment and involvement opportunities) found in the current study to the sport commitment of athletes with disabilities. Especially for elite level athletes who are highly independent and committed to their sports, the impact of and magnitude of contribution of social support might be overshadowed by other variables. It is also possible that it is the measurement of social support specifically, and not the construct of social support that affected the relationship to sport commitment in the present study. The lack of a significant influence of social support on sport commitment may be a reflection of the type of support measured. Social support, as measured in the current study, focused on emotional and informational support, and both types of social support were pulled together as one construct to examine the relationship with sport commitment. In this condition, the present findings might not be able to reflect the effect and importance of both types social support on sport commitment respectively. Additionally, Martin and Mushett (1996) and Martin (2015) argued family and friends are strong resources of training support for athletes with disabilities. Similarly, Swanson, Colwell, and Zhao (2008) found that long-term

athletes with physical disabilities sought social support to enhance self-esteem more than novices. The discrepancy between the present study and that reported in the literature might be caused by neglecting the functions of different types of social support (e.g., instrumental, appraisal) provided to athletes with disabilities.

As was the case for the non-significant effect of social constraints, it is possible that the influences of significant others on adult athletes with disabilities become less and less with age (Eng & Martin Ginis, 2007; Kosma et al., 2009). Similar results are supported from Swanson, Colwell, and Zhao (2008), who found that the motivation of social interaction to sport participation for adults athletes with physical disabilities became less important than for youth athletes. Their study also found that youth athlete with physical disabilities required more social support than adults. It may be premature to conclude that social support is not a meaningful contributor to sport commitment in persons with disabilities. Future measurement of sport commitment should consider the different types of social support provided to and/or used by athletes with disabilities at different developmental ages and stages of their sport career.

The status of elite athletes could also assist our participants to overcome the problems of accessing sport facilities and recourses. The present participants, who were elite athletes participating in national and international level sport tournaments and have been involved in sports for many years, might have certain methods to access those resources for their training. Given their status, accessibility of sport facilities and settings would likely not be a concern impacting their continued sport participation. However, accessibility of sport facilities and settings has consistently been found to be a barrier for individuals with disabilities (Jaarsma et al., 2014; Kang et al., 2007; Littman et al., 2014; Martin, 2013; Rimmer, 2004) and thus remains an issue for the larger population of people with disabilities who are at novice level and/or do not

compete at national or international level sport tournaments. The findings suggesting access to sport facilities and settings is not a barrier to continued sport participation for elite athletes with disabilities in the present study, should not be generalized to other levels of participation (e.g., community-level), and likely remains an issue for equal access and opportunity for people with disabilities to engage in sport and physical activity (Jaarsma et al., 2014; Kang et al., 2007; Littman et al., 2014; Martin, 2013; Rimmer, 2004).

The Ecological Model. The original purpose of extending the SCM by incorporating the ecological model was to provide an organization to examine how the sport commitment model could be conceptualized more succinctly given nine antecedents reflecting three different levels (personal, social, environmental) of influence on sport commitment so researchers, practitioners, and policy makers can more easily identify the proportion of the impact of the different levels on the sport commitment, and subsequently manipulate and intervene at the desired level to make the most meaningful influence on sport participation and continued commitment for enhanced quality of life and well-being in individuals with physical disabilities. Due to the non-positive-definite matrix and no significant contributions of the four new proposed predictors on sport commitment, continuing to examine the three levels of the ecological model with the nine variables became less meaningful in the present study. However, this does not mean that the concept of categorizing nine variables into three levels is an invalid idea. According to the literature, an ecological model is commonly used for categorization purpose in order to be more efficient and systematic when discussing many research topics. For example, Newes-Adeyi, Helitzer, Caulfield, and Bronner (2000) adopted the framework (individual, interpersonal, organizational levels) of the ecological model to guide a formative research training program for a child growth monitoring project. The same idea was also applied in the physical education area.

Jaarsma et al. (2014b) and Martin (2013) used the concept of individual, social, environmental levels from the ecological model to categorizing benefits and barriers to physical activities for individuals with disabilities. In the future, adopting an ecological model while examining the extended SCM model with a large sample size and more diverse populations (e.g., age, level of competition) is highly recommended.

Model Testing

The second purpose of this study was to investigate the parsimony among the original model, mediation model, and direct/indirect model of sport commitment. The chi-square difference test was used to determine the parsimonious model between mediation and direct/indirect model. While both models were a viable explanation of sport commitment for athletes with physical disabilities, results supported the study hypothesis that direct/indirect model had better model fit than the mediation model. Direct model findings, were similar with the baseline model examining direct impact of five antecedents, suggesting that when athletes with physical disabilities invest more resources in and expect to gain desired benefits from their sport participation, they are more likely to continue their sport involvement. The indirect model indicated inconsistent findings with previous literature (Casper et al., 2007; Choosakul et al., 2009; Weiss et al., 2001). That is, although expecting desired benefits from continued sport involvement could bring positive emotions (e.g., enjoyment), enjoyment did not influence athletes' desire and resolve for sport participation. Although the model fit is at a satisfactory level, it appears that the mechanism of using sport enjoyment, as a mediator filtering the effect of the other variables (personal investment, involvement opportunities, social constraints, involvement alternatives) on sport commitment, may not hold true in athletes with physical disabilities. The notion of enjoyment as a mediator to sport commitment originated from Weiss et al. (2001), who

reported, based on past research findings, enjoyment to be the biggest contributor predicting sport commitment. From a statistical perspective, enjoyment appeared to suppress the effects of the other four antecedents, thereby playing the role of mediator filtering the contribution of the other variables. However, in the present study, while enjoyment had a significant prediction on sport commitment in the mediation model, its contribution to sport commitment prediction in the direct/indirect model had disappeared. In contrast, the effects of involvement opportunities on sport commitment in both mediation and direct/indirect model remained the same. The effect of enjoyment on sport commitment could be suppressed by involvement opportunities. For athletes with disabilities, compared with those without disabilities, gaining benefits from continued sport participation may be more important than having fun and obtaining positive emotions for long term sport commitment.

As for model selection between the original and direct/indirect model, chi-square difference test cannot be applied to determine parsimony between the original model and direct/indirect model (Bentler & Mooijaart, 1989; Preacher, 2006). From a statistical perspective, both models showed satisfactory levels of goodness-of-fit indices and no difference findings in improving the sport commitment of athletes with physical disabilities. However, based on the principle of parsimony, the original model is more theoretically plausible because there is no complicated mechanism, such as mediation effect of sport enjoyment, and all the variables may only have direct influences on sport commitment. The original model appears to offer the most application to manipulate certain antecedents to understand and enhance individuals' with disabilities sport participation and commitment.

Limitations and Future Research Direction

There were various limitations that may have impacted the results of this study. First, this

study was underpowered. Based on Soper's (2016) A-priori Sample Size Calculator for SEM, data from 200 participants was a minimum requirement to provide adequate power to detect a medium effect. However, only 157 participants, comprised the dataset used for analysis in the present study. The inconsistent and non-significant findings of enjoyment (Chu & Wang, 2012; McDonald, Côté, Eys, & Deakin, 2011; Casper, Gray, & Stellino, 2007) and self-efficacy (Bandura, 1977; Dixon-Ibarra and Driver, 2013) with previous research results might be due to low statistical power to make type II error. In order to avoid compromising the statistical power, multiple imputation technique can be considered to address the missing value problem for the future study. In addition, given the effect of small sample size, sample covariance or correlation matrix was not positive definite that might be due to mere sampling fluctuation. Although bootstrapping technique was performed to increase sample variation, the quality of raw data was not good enough to create more variation to address the non-positive-definite matrix issue. In future studies, researchers should pay attention to the representativeness of participants. Moreover, in order to avoid reducing sample size, all the data were pooled together regardless of demographics (e.g., gender, nationality, skill level, race) for data analyses. In this case, there might have been group differences that were ignored that could have lead to a loss of information and results bias. Sufficient power with a larger and more diverse sample for future research is needed while examining 9 variables of the SCM for individuals with disabilities.

A second limitation relates to the method used for data collection and possible sample bias. Data collection was through self-report questionnaires and the distribution of online survey link was through coaches and local and national disability sport organizations. Over 1500 emails were sent out to athletes with disabilities and 10 social media sites were used to disseminate the survey link. However, response rate was extremely low. Response rate from online surveys has been

identified to be relatively lower than paper surveys (Nulty, 2008). Non-response bias may cause a concern while interpreting and generalizing the research findings. Efforts to recruit participants using, face-to-face administration of a survey would likely increase sample size and reduce non-response bias to better generalize the findings to a larger population of athletes with disabilities and should be considered as a supplemental method for data collection in addition to online surveys when possible.

Third, the validity of negative consequences of sport participation and accessibility of sport facilities and settings may raise a concern. Although the results showed that the scales of negative consequences of sport participation and accessibility of sport facilities and settings had gone through the procedure of content validation, had good reliability, and had good model fit from CFA examinations, the structure and validity of these constructs remains unknown and is questionable. Possibly, the lack of significance of both variables may be due more to measurement issues than to the barriers they were trying to address. In order to ensure the usability of these two scales for future studies, the approaches of construct validity and/or criterion-related validity are encouraged to validate both scales.

Conclusions and Recommendations

Many authors have used selected variables from the SCM in their research. This study was among the first to our knowledge to apply the whole theoretical framework of SCM to athletes with disabilities. Overall, the current findings showed that the original SCM was an effective and a viable theoretical model that could potential apply to athletes with disabilities and understand variables influencing their sport commitment. This study revealed the importance and effects of personal investment and involvement opportunities in increasing athletes with physical disabilities desire and revolve of continued sport participation. On the other hand, enjoyment,

social constraints, involvement alternatives and the new proposed four variables did not reveal statistical significance in predicting sport commitment of athletes with disabilities. With regard to model selection, direct/indirect model had better model fit indices than mediation model.

However, comparing direct/indirect model with original model, the original SCM model was the most appropriate model for understanding the impact of five antecedents (enjoyment, personal investment, involvement opportunities, social constraints, involvement alternatives) to sport commitment in athletes with physical disabilities.

Disability sports programs should mainly focus on the desired benefits of athletes with physical disabilities for sport participation. Involvement opportunities is defined as the benefits that can only be derived from continuing participation. In other words, the reason why athletes would like to continue their sport participation is because there is something specifically they want from their continued sport participation. Therefore, coaches and disability sport organization should understand the needs of athletes, and programming should be designed towards that direction. As long as the sports programs provide unique values and benefits from continuing sport participation, athletes with disabilities would be more likely to stay in the programs. In addition, due to the important role of personal investment on sport commitment, if coaches want athletes with disabilities to have high commitment to their current sport, coaches need to help find a way to increase the investment of effort, time, and money of athletes with disabilities. For example, coaches could properly educate their athletes about “Don’t let your investment be in vain.” Also, coaches should try to motivate their athletes with physical disabilities to put more effort and time to achieve their goals. Once their personal investment increases, they are more likely to stay in their sport programs.

The original SCM has been verified as an effective theoretical model in explaining how the

state of sport commitment of adult elite athletes with disabilities has been influenced by enjoyment, personal investment, involvement opportunities, social constraints, and involvement alternatives. However, the effects of the original SCM, mediation and direct/indirect models, new unique variables, and ecological model still remain unknown for its effectiveness to other developmental ages (e.g., children, youth) and stages (e.g., beginner) of athletes with disabilities. Further examinations and applications of this theoretical model in individuals with disabilities is needed and encouraged.

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APPENDICES

Appendix A

Feedback and Rating form for Negative Consequences of Sport Participation and Accessibility of Sport Facilities and Settings questionnaires - Experts

Instruction. Please evaluate the following statements using the 3-point Likert scale for measuring consequence of exercise the sport participation and accessibility for exercise and sport in persons with physical disabilities.

Please provide specific feedback and comment if you think the wording of the items needs to be revised.

Negative Consequences of Sport Participation

I feel	Strongly disagree	Neither agree nor disagree	Strongly agree
Participating in sports is too dangerous for me.			
Feedback.			
Muscle pain and soreness will keep me away from sports			
Feedback.			
Exercising makes me feel weak and fatigued			
Feedback.			
Participating in intensive sports makes me feel vulnerable			
Feedback.			

Accessibility of Sport Facilities and Settings

I feel	Strongly disagree	Neither agree nor disagree	Strongly agree
Sport facility is too far for me to travel to.			
Feedback.			
Equipment is too difficult for me to use.			
Feedback.			
There are too few options for me to choose from.			
Feedback.			

There is a challenge for me to access either indoor or outdoor areas.			
Feedback.			
There is no information for me to access physical activity			
Feedback.			
Sport facility and environment is not safe			
Feedback.			
Coach/trainer has no experience and knowledge to teach me			
Feedback.			
People see me differently, and that makes me feel uncomfortable			
Feedback.			

Instruction. Please provide suggestions of additional potential items that you feel should be added to measure the negative “Consequence of Exercise and Sport Participation” and “Accessibility for Exercise and Sport.”

Negative Consequences of Sport Participation

1.
2.
3.

Accessibility of Sport Facilities and Settings

1.
2.
3.

Appendix B

Demographic Questionnaire

Instructions: Please write or check the answer that best matches your response to each statement below.

1. Age: _____	2. Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Transgender <input type="checkbox"/> Other
3. Race: <input type="checkbox"/> White or Caucasian <input type="checkbox"/> Asian <input type="checkbox"/> Black or African American <input type="checkbox"/> Native Hawaiian or Pacific Islander <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Multiracial <input type="checkbox"/> Other	
4. Name of Disability (e.g., cerebral palsy, amputation): _____ 5. Age of Onset of Disability: _____	6. Severity of Disability: <input type="checkbox"/> Mild <input type="checkbox"/> Moderate <input type="checkbox"/> Severe <input type="checkbox"/> Profound
7. Please list the current sports that you play the most by order and indicate the years of participation. 1) _____ Years: _____ 2) _____ Years: _____ 3) _____ Years: _____ 4) _____ Years: _____ 5) _____ Years: _____	
8. Please indicate the <u>level of participation</u> and <u>degree of perceived competitiveness</u> for the “Rank 1” sport you answered on question 7. Level of Participation: <input type="checkbox"/> Community level <input type="checkbox"/> Regional level <input type="checkbox"/> State-wide level <input type="checkbox"/> National level <input type="checkbox"/> International level Degree of perceived Competitiveness <input type="checkbox"/> Very Competitive <input type="checkbox"/> Competitive <input type="checkbox"/> Sort of competitive <input type="checkbox"/> A little competitive <input type="checkbox"/> Not at all competitive	

Appendix C

Sport commitment questionnaire

Instructions. The following questions are about your experience and feelings of sport participation. While answering the most appropriate statement for you by checking a number on the 5-point scale, please think of the sport that you play the most.

Sport commitment	Not at all dedicated	A little dedicated	Sort of dedicated	Dedicated	Very dedicated
	1	2	3	4	5
1) How dedicated are you to playing in your main sport?					
	Not at all hard	A little hard	Sort of hard	Hard	Very hard
2) How hard would it be for you to quit your main sport?					
	Not at all determined	A little determined	Sort of determined	Determined	Very determined
3) How determined are you to keep playing in your main sport?					
	Nothing at all	A few things	Some things	Many things	A lot of things
4) What would you be willing to do to keep playing in your main sport?					
Sport Enjoyment	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1) Playing this sport is fun.					
2) I like playing this sport.					
3) I love to play this sport.					
4) Playing this sport is very pleasurable.					
5) Playing this sport makes me happy.					
Personal Investment	None	A little	Some	Pretty much	Very much
	1	2	3	4	5
1) How much of your time have you put into playing in your main sport this season?					
2) How much effort have you put into playing in your main sport this season?					
3) How much of your own money have you put into playing in your main sport this season for things like entrance fees or equipment?					
Involvement Opportunities	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5

1) There are future events in this sport that I would really miss experiencing if I no longer played.					
2) I would really miss the travel experiences I have if I no longer played this sport.					
3) I would really miss the things I learn in this sport if I didn't play.					
4) I would really miss the competition in this sport if I no longer played.					
Social constraints	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1) People would be upset if I didn't keep playing this sport because they have invested so much.					
2) People would be disappointed if I didn't keep playing this sport.					
3) Because people who are important to me also play this sport, it is assumed that I will keep playing.					
4) People who are important to me expect me to keep playing this sport.					
Involvement alternatives	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1) Other things in my life (e.g., work, family, school, etc.) make it difficult to play this sport.					
2) I am being pulled away from this sport by other things in my life.					
3) It is almost impossible to play this sport because of other things in my life.					
4) There are other things in my life that limit my participation in this sport.					
5) Other things in my life compete with playing this sport.					

Appendix D
Sport Self-Efficacy Scale

Instructions. This is a scale that measures your confidence in your ability to engage in sport. All the items will have the following stem “I am confident...”

Please read each statement carefully before answering, and indicate how confident you are by **checking a number on the 4-point scale.**

I am confident	Not at all true	Rarely true	Moderately true	Always true
	1	2	3	4
1) that I can overcome barriers and challenges with regard to sport if I try hard enough.				
2) that I can find means and ways to participate in sport				
3) that I can accomplish my sport goals that I set.				
4) that when I am confronted with a barrier to sport I can find several solutions to overcome this barrier.				
5) that I can still participate in sport even when I am tired.				
6) that I can participate in sport even when I am feeling depressed.				
7) that I can still involve in sport even without the support of my family or friends.				
8) that I can participate in sport without the help of a therapist or trainer.				
9) that I can motivate myself to start participating in sport again after I've stopped for a while.				
10) that I can participate in sport even if I had no access to a gym, sport, training, or rehabilitation facility.				

Appendix E

Negative consequences of sport participation

Instructions. This is a scale that measures your feelings and experiences of sport participation based on your previous experience. All the items will have the following stem “Participating in sport...”

Please read each statement carefully before answering, and indicate how you feel about your sport experience and participation overall by **checking a number on the 5-point scale.**

Participating in sport	Strongly disagree	Somewh at disagree	Neither agree nor disagree	Somewh at agree	Strongly agree
	1	2	3	4	5
1) Makes me feel frustrated because of poor performance					
2) Is dangerous for me					
3) Results in muscle pain					
4) Makes me feel fatigued					
5) Results in muscle soreness					
6) Makes me feel vulnerable to an injury					
7) Exacerbates my disability					

Appendix F

Social Support

Instructions. This is a scale that measures how supportive significant others (e.g., parents, friends, coaches, etc.) are to your sport participation.

Please read each statement carefully before answering, and indicate your feelings about significant others' support by **checking a number on the 5-point scale**.

Social support-emotional	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1) People who are important to me attend the majority of my competitions in this sport.					
2) People who are important to me are there for me after I perform poorly in this sport.					
3) When things get tough in this sport, people who are important to me provide comfort.					
4) When I compete in this sport, people who are important to me cheer me on.					
Social support-informational	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1) I have a mentor who provides guidance in this sport.					
2) People who are important to me teach me the strategies of this sport.					
3) People who are important to me teach me about the mental side of this sport.					
4) People give me trustworthy advice about this sport.					
5) In this sport, people provide useful instruction to improve my performance.					

Appendix G

Accessibility of Sport Facilities and Settings

Instructions. This is a scale that measures accessibility to sport programs. All the items will have the following stem “I feel...”

Please read each statement carefully before answering, and indicate how you feel by **checking a number on the 5-point scale.**

I feel	Strongly disagree	Somewh at disagree	Neither agree nor disagree	Somewh at agree	Strongly agree
	1	2	3	4	5
1) Most sport facilities are too far for me to travel to regularly					
2) Most sport equipment is too difficult for me to use					
3) There are too few sport facilities for me to choose from					
4) There is a challenge for me to access indoor sport areas					
5) Sport equipment is too expensive					
6) Sport environment is not safe					
7) It is difficult to find information about sport opportunities					
8) Most outdoor sport areas are difficult to access					
9) There are too few sport programs available to me					
10) Most sport facilities are not safe for me					
11) Most coaches/trainers have no experience and/or knowledge to teach me					