A QUANTITATIVE ANALYSIS OF THE BEHAVIORAL CHECKLIST OF THE MOVEMENT ABC MOTOR TEST

Luis Miguel Ruiz
University of castilla La Mancha. Toledo
Marta Gómez
la Poveda Secondary School. Madrid
Jose Luis Graupera
University of Alcalá de Henares
Melchor Gutiérrez
University of Valencia
José Luis Linaza
Autonomous University of Madrid

The fifth section of the Henderson and Sugden's Movement ABC Checklist is part of the general Checklist that accompanies The Movement ABC Battery. The authors maintain that the analysis of this section must be mainly qualitative instead of quantitative. The main objective of this study was to employ a quantitative analysis of this behavioural checklist with a Spanish sample of 1,128 school children that were assessed by their physical education teachers. Teachers applied this Behavioural Section in its Spanish version to children and the analysis of the data showed an orthogonal two-factor solution with high internal consistency. These factors were labeled: Impulsiveness and Passiveness. This quantitative version was applied in studies about clumsiness and demonstrated that this checklist is a user-friendly instrument for physical education children.

Competence is defined as a general capability of an individual to interact effectively with his environment and a personal sense of competence has been considered as a human need by many scholars (White, 1959). It is a perceived mastery of skills in different domains: motor, cognitive and social and children can strive for a sense of competence by challenging themselves and others in physical education, sport and games (Treasure, 2001).

Literature about the concept of motor competence makes a broad distinction between an emphasis on the development and mastery of motor skills (Keogh & Sudgen, 1985; Ruiz, 1995) and a motivational approach where motor ability is related to behavioural and personality development (Connolly & Bruner, 1973). Playing, curiosity and exploratory behaviours of children are based on the need to interact effectively with the environment, and these functional notions are those that refer to the effective physical participation of a subject in his or her environment. What happens when children can't express this kind of ability? During the last decades different scholars have demonstrated the existence of motor competence difficulties among school children (Henderson, 1993; Cratty, 1994; Ruiz, 2005). These difficulties may be evident in fine and gross motor tasks or in the expression of different subtypes of clumsiness. Skill level, as Tsalavoutas and Reid (2006) expressed, can influence performance accomplishments and competence satisfaction in intriguing ways (p.410).

Researchers have shown that schoolchildren with movement difficulties have lower perceived motor competence than their more competent peers (Cratty, 1994; Sudgen & Wright, 1998; Kurtz, 2003; Gómez, 2005) and have demonstrated that apart from motor coordination difficulties, these children show many behavioural signs that don't help them to resolve their condition.

Motor competence problems are many times accompanied by social, emotional and behavioural expressions, such as low self-esteem, poor goal setting, low self-concept, less inclination to accept responsibility and make decisions, isolation, lack of self-confidence and poor social acceptance and social ability, etc. (Losse, Henderson, Elliman, Hall, Knight, & Jongmans, 1991; Henderson, May, &

Umney,1989; Knight, Henderson, Losse, & Jongmans, 1992; Cratty, 1994; Rasmussen & Gillberg, 2000).

One of the main sources of information about the impact that motor competence difficulties have on children are teacher's and parent's reports (Ahern, 2002; Mandich, Polatajko, & Rodger, 2003). Parents know well the behaviours that accompany the difficulties of their children, and their negative consequences. They know that their children feel frustrated and isolated, that they want to make friends but can't; that they are the last to be selected to form part of a team because of their clumsiness. They know how their children feel when they are excluded, that they are the centre of jokes, and that they are bullied by other children.

Children judged as clumsy by their physical education teachers were also considered as submissive and withdrawn, sometimes with problems of control, impulsiveness or passiveness, lack of satisfaction, lack of self-confidence, etc. (Sudgen & Wright, 1998; Gómez, 2005;). This behaviors influences their motor performance in physical education classes and inhibits them to participate, and reduces their vital capacity (Cermak & Larkin, 2001).

In conclusion, this lack of motor competence is accompanied by different behavioural expressions that don't help children to improve their condition. The study of children's motor competence need to consider the emotional and psychological dimensions, and different researchers have used scales, checklists or questionnaires to explore these psychological aspects of children's motor ability (Sudgen & Wright, 1998; Gómez, 2005; Ruiz, 2005).

Cratty (1994) employed a revised version of the Pier-Harris Self Opinion Questionnaire. This study reported that clumsy children were sad most of the time in contrast to the physically adequate children. They didn't believe themselves to be strong, and they preferred to watch more than to play games. Henderson, May, & Umney (1989) studied goal-setting, self-concept and locus of control of clumsy children and found clear differences in comparison with children without coordination problems, too.

The fifth Section of the Movement ABC Checklist

The Movement ABC Battery is one of the more recognized instruments developed for the detection or evaluation of clumsiness in children (Burton & Miller, 1998). This instrument has two parts, the motor test and an observational tool, the movement ABC Checklist. This checklist was designed specifically to assess functional competence progressively in realistic everyday tasks. The rationale of this checklist is a theoretical analysis of the movement skill development proposed originally by Gentile, Higgins, Miller, & Rosen (1976). As a part of this Checklist, Henderson & Sugden (1992) presented a 5th Section for assessing behaviours related to physical activity. These behaviours are not indicators of coordination problems per se, because a skilful and an unskillful child could score high or low in this section, but they are often seen in children with clumsiness and those that professionals have indicated as being potentially problematic in the gymnasium or the playground.

This fifth section presents the selection of twelve of these behaviours that represent aspects such as hyperactivity, passivity, tension and shyness, underestimate and overestimate their own ability, confusion, distractibility, problems with their perception of motor ability and/or motivation. As the authors declare these items are the most representative behaviours that parents and teachers have reported as being detrimental to a child's motor performance: *The observation of these behaviours will provide relevant information for the evaluation of observations from Sections 1 to 4* (Henderson & Sudgen, 1992, 28).

Authors recommend that the analysis of this scale should be qualitative instead of quantitative, and its contribution is the additional information they'll give about children's behaviours to teachers, parents and/or psychologists.

The purpose of this study was to offer a quantitative version of this section and to study how physical education perceived different behavioural manifestations in children in general, showing the evolution of these behaviours along childhood. In order to do this, we introduced a small modification of the scale and instead of a 3-point scale (0 (rarely) to 2 (Often), we used a 4–point scale in our study for each behaviour: 1 (rarely) to 4 (very often) (Table 1).

Table 1
Items of the Fifth Section of the Movement ABC Checklist

Movement assessment Battery for Children Checklist-Behavioural problems relating to motor difficulties
(Henderson & Sudgen, 1992)

The child is:

1. Overactive (Squirms and fidgets, moves constantly when listening to instructions, fiddles with clothes.
2. Passive (Hard to interest, requires much encouragement to participate, seems to make little effort)
3. Timid (fearful of activities like jumping And climbing, doesn't want to move fast, constantly ask for help).
4. Tense (appears nervous, trembles, fumbles with small objects, becomes flustered in a stressful situation)
5. Impulsive (starts before instructions/demonstrations are completed; impatient of detail).
6. Distractible (looks around, responds to noises/movements, outside the room)
7. Disorganized/confused (has difficulty in planning a sequence of movements, forgets what to do next in the middle of a sequence)
8. Overestimates own ability (tries to change tasks to make them more difficult, tries to do things very fast).
9. Underestimates own ability (says tasks are too difficult, makes excuses for not doing well before beginning).
10. Lacks of persistence (gives up quickly, is easily frustrated daydreams)
11. Upset by failure (looks tearful, refuses to try task again)
12. Apparently unable to get pleasure from success (makes no response to feedback, has a blank facial expression).

Method

Participants

In this study participated 1.128 school children, 570 girls (50. 5%) and 558 boys (49. 5%), between ages of 4 to 14 years old, with a mean age of 8.3 (SD= 2.8) from different private and public schools from Madrid and Valencia (Spain). Once parental and guardian's permissions were assured, testing dates and times were arranged with teachers. The number of participants by age range is summarized in Table 2.

Table 2.
Number of children participants by sex and age band

		Sex		Total
		Boys	Girls	
Age band	4 - 6 yr	218	200	418
	7 - 8 yr	75	90	165
	9 - 10 yr	93	103	196
	11 - 12 yr	142	153	295
	13 - 14 yr	30	24	54
Total		558	570	1128

Procedure

Physical education teachers of primary and secondary levels, with more than ten years of pedagogical experience participated voluntarily in this study. All of them were involved in different workshops about the Movement ABC Test and received lectures about the behavioral characteristics that this checklist represented and their expressions in physical education classes. During these workshops teachers learned how to use it in simulated situations filmed by the researchers.

These simulated situations consisted in the observation of thirty minute P.E. classes with children that represented the majority of behaviours that they have to check and completed on the checklist. The main purpose of these simulated situations was to identify if these teachers had really understood the main characteristics of these behaviours and could detect them.

This experience corroborated Wright, Sudgen; Ng & Tan (1994) data with Singaporean teachers, confirming that this checklist is a user-friendly instrument and that a school teacher has enough education and knowledge to complete it with ease. The teachers received the behavioural checklist and it was left with them for 3 weeks. During these weeks they have to observe their children moving in their physical education classes and completed the checklist. There was a 100% return rate.

Results

A principal factor analysis with varimax rotation was performed on the inter-correlation matrix for the twelve items of this Fifth Behavioural Section of the Movement ABC Checklist. The factorial structure and teachers' consistency rating of the instrument was examined and two factors emerged. All statistical analysis were made with SPSS.12 and the principal component analysis with PRELIS 2.54. The rotated factor loadings are presented in Table 3.

Table 3.

Rotated factor loadings for the fifth section of the Movement ABC Checklist

Component	Item	Loading
Impulsiveness	Impulsive	.94
	Overactive	.86
	Tense	.60
	Distractible	.60
	Overestimates own ability	.59
	Eigen value	4.86
	Percentage of variance	40.54
	Alpha coefficient	.80
Passiveness	Passive	.81
	Lacks persistence	.81
	Underestimates own ability	.79
	Disorganized/confused	.76
	Timid	.73
	Unable to get pleasure	.65
	Upset by failure	.52
	Eigen value	2.93
	Percentage of variance	24.44
	Alpha coefficient	.82

These two factors accounted for between 40.54% and 24.44 % of the variance in the set of items. The total percentage of variance accounted for was of 64.98 %. All loadings in the two factors were higher than .50 . These results suggest that items of the Movement ABC Checklist Section measured two orthogonal dimensions of behavioural expressions that can accompany motor performance, and they were named: Impulsiveness and Passiveness.

Reliability

Cronbach's alpha was calculated for each dimension of this checklist. The first dimension Impulsiveness with five items had the lowest coefficient: α: .80 and the second dimension Passiveness, with seven items had the highest α: .82. These are good coefficients and we can consider that this checklist can have a widely use (Carmines and Zeller, 1979; DeVellis, 2003)

This Behavioural Section of the Movement ABC Checklist distinguishes between two groups of behaviours, one group related to impulsiveness, overreaction, tension and overestimation of their own abilities, and the other related to passiveness, lack of confidence in their own abilities, shyness or lack of persistence.

Descriptive and Differential analysis

Table 4 presents the descriptive data in the two subscales in reference to the age band of the participants and their sex. MANOVA analysis and multivariate tests of significance (Wilks lambda and approx. F) were applied with four levels for the first factor (Age band), two levels for the second factor (sex) and to the interaction between age and sex. These analysis showed that there were significant differences among the different age bands and in the interaction of sex and age but with reference to sex (Table 5).

Table 4.
Mean and standard deviations for the four age bands

Age Band							
	Sex		4-6 yr	7-8 yr	9-10 yr	11-12 yr	13-14 yr
Passiveness	Boys	M	1.78	1.80	1.43	1.44	1.74
		SD	.67	.63	.47	.44	.65
	Girls	M	1.81	2.02	1.70	1.52	1.30
		SD	.65	.70	.64	.53	.31
Impulsiveness	Boys	M	1.49	1.68	1.53	1.42	1.37
		SD	.49	.73	.53	.46	.35
	Girls	M	1.49	1.75	1.46	1.34	1.51
		SD	.46	.68	.55	.39	.46

Table 5.
Multivariate analysis of Variance. Multivariate tests of significan**ce**

Effect	Wilks Lambda	F	Hypoth DF	Error DF	Sig.of F
Age band	0.91	13.56	8.00	2222.00	<.0001
Sex	1.00	.24	2.00	1111.00	.787
Age band *sex	0.98	3.02	8.00	2222.00	.002

These effects were evaluated through univariate F-tests of significance on each dependent variable. Post-hoc multiple comparisons tests analysis (Bonferroni criteria) was employed as needed, trying to establish the differences among age groups. The fiduciary limit of p< .05 was set for results to be regarded as significant.

Table 6 shows two significant differences in passiveness and impulsiveness (p<.0001) in relation to age and an interaction between age and sex. It is interesting to say that there is a clear decrement in the passiveness dimension at 8 years. This change is constant in girls between 8 to 14 years old. This is the reason of the significant interaction effect between age and sex. If we consider impulsiveness we can say that its highest manifestation was at 7-8 years, during the rest of years this dimension is very similar between boys and girls. No other significant differences were obtained. Post-hoc multiple comparisons tests (Bonferroni criteria) indicated that there were significant differences among age bands in the two subscales (Table 7).

T***able 6.***
Multivariate analysis of Variance. Univariate F-test of signifi**cance**

Factor	Component	F	df	Sig.
Age band	Passiveness	20.36	4	<.0001
	Impulsiveness	11.24	4	<.0001
Sex	Passiveness	.46	1	.493
	Impulsiveness	.06	1	.798
Age band*sex	Passiveness	4.36	4	.002
	Impulsiveness	.99	4	.411

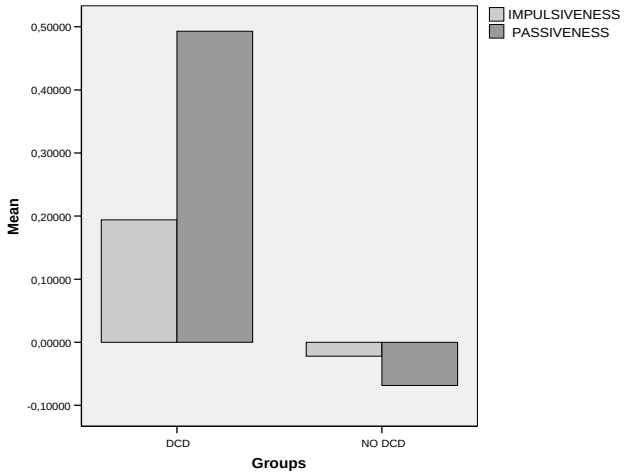

Figure 1.
Standardized scores of the two dimensions of the Behavioral Checklist in Ruiz, Graupera, & Gutierrez's (1997) study

Aplicability of the Behavioral Checklist

Ruiz, Graupera & Gutiérrez used this checklist format in their 1997 study. A total of 962 primary schoolchildren (4 to 14 yr.) performed the Movement ABC test and were classified following the conditions of the test. Sixty four children manifested motor coordination problems. P.E. teachers applied the checklist and the results showed differences between children with and without movement difficulties in the two dimensions of the checklist (Fig. 1 above). In general, children with movement problems were considered more impulsive and passive than the rest of the children.

Table 7.
Multiple comparisons by age band

Factor	Age band		Mean differences	Std Error	Sig.
Passiveness	4-6 yr	7-8 yr	-.124	.055	.261
		9-10 yr	.219	.052	.000
		11-12 yr	.314	.046	.000
		13-14 yr	.247	.087	.047
	7-8 yr	4-6 yr	.124	.055	.261
		9-10 yr	.343	.063	.000
		11-12 yr	.438	.058	.000
		13-14 yr	.371	.094	.001
	9-10 yr	4-6 yr	-.219	.052	.000
		7-8 yr	-.343	.063	.000
		11-12 yr	.094	.055	.885
		13-14 yr	.027	.092	1.000
	11-12 yr	4-6 yr	-.314	.046	.000
		7-8 yr	-.438	.058	.000
		9-10 yr	-.94	.055	.885
		13-14 yr	-.067	.089	1.000
	13-14 yr	4-6 yr	-.247	.087	.047
		7-8 yr	-.371	.094	.001
		9-10 yr	-.027	.092	1.000
		11-12 yr	.067	.089	1.000
Impulsiveness	4-6 yr	7-8 yr	-.226	.047	.000
		9-10 yr	-.003	.044	1.000
		11-12 yr	.112	.039	.043
		13-14 yr	.061	.074	1.000
	7-8 yr	4-6 yr	.226	.047	.000
		9-10 yr	.223	.054	.000
		11-12 yr	.339	.050	.000
		13-14 yr	.228	.080	.004
	9-10 yr	4-6 yr	.003	.044	1.000
		7-8 yr	-.223	.054	.000
		11-12 yr	.115	.047	.152

	13-14 yr	.064	.079	1.000
11-12 yr	4-6 yr	-.112	.039	0.43
	7-8 yr	.-.339	.050	.000
	9-10 yr	-.115	.047	.152
	13-14 yr	-.058	.076	1.000
13-14 yr	4-6 yr	-.061	.074	1.000
	7-8 yr	-.288	.080	.004
	9-10 yr	-.064	.079	1.000
	11-12 yr	.050	.076	1.000

Gómez (2004) used in her study about clumsiness among secondary schoolchildren, too. One hundred and twenty adolescents (12 to 14 yr.) performed the four tasks of the Kiphard and Schilling's (1976) Body Coordination Test (BCT) and were classified in three groups (Problematic, Symptomatic and Normal) following the instructions of the test. Physical Education teachers of these students completed the Behavioral Checklist and the results showed that passiveness was the main expression of children

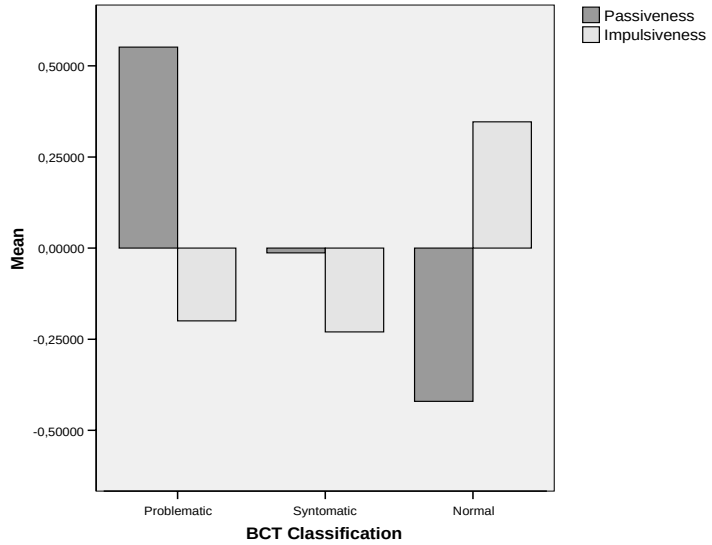

Figure 2
Standardized scores of the two dimensions of the Behavioral Checklist in Gómez's (2004) (1997) study

with motor clumsiness in comparison to children without motor coordination problems (Fig. 2), i.e.,children with motor coordination problems were characterized by their teachers as passive, without persistence in their tasks, with a low perception of competence, confused and disorganized, unable to get pleasure in physical education classes and upset with their failures, characteristics that corresponds with data of multiple studies about the behavioral manifestations of these children (Schoemaker & Kalverboer, 1994; Smyth & Anderson,2000; Skinner, 2002). Gómez (2004) conclude that this checklist format was applied by teachers without any problem, and they were able to establish the intensity of the presence of every behavioral manifestation in their students.

Discussion

The purpose of this research was to analyze the transformation of Movement ABC Behavioral Checklist to a quantitative instrument with the objective of permitting P.E. teachers to use it easily and to obtain more behavioural data of their students in the gymnasium.

Every teacher knows that a child has its own behavioural characteristics during the process of learning and performing motor skills. Every performance is expressed with a background of personal, sensorial-perceptual and motor impressions that must be coordinated in order to produce meaningful activity results. Teachers and parents perceive that their pupils and sons show many different behaviours and that some of them are useful in order to perform their motor skills better, but others are an obstacle for their motor ability.

Children have to select and organize relevant information in order to solve motor problems and act with a minimum plan, and other have problems because they feel clumsy or overestimate their ability showing self- control problems, and these problems are combined with different behaviours like:

distractibility, hyperactivity, passiveness, perseverance, des-inhibition, fear, poor feeling of motor ability, etc, and many teachers and parents of children with motor difficulties find easiest to rate a behaviour than explaining it.

Henderson & Sudgen (1992) translated these characteristics and descriptions into their Movement ABC Checklist. Their objective was to combine motor observations with behavioural characteristics of children in order to have a complete picture of their situation. Checklists like Henderson and Sudgen's 5th Section help teachers and parents to describe children's tendencies better, and begin the compensatory education as soon as possible (Morris & Whiting, 1971; Cratty, 1994; Sugden & Wright, 1998; Ruiz, 2005).
The results of our study consolidate the intention of the authors' checklist and confirm the existence of two behavioural dimensions among these twelve behaviours, one dimensions related with impulsiveness and other with passiveness, behaviours that change along childhood, and that manifest their differences when children have movement difficulties.

Ruiz, Graupera & Gutiérrez (1997) with the M-ABC test and Gómez (2004) with the Body Coordination test found differences in these two dimensions between children with and without motor coordination problems. Children with motor coordination problems showed more passiveness and impulsiveness than their motor competent peers during the primary years and more passive during the secondary years when their teachers observed them.
These results support the contentions that this checklist is a user-friendly instrument for physical education teachers, and this kind of modification can help them to use it more easily.

References

Ahern, K. (2002). Developmental coordination disorder: Validation of a qualitative analysis using statistical factor analysis. *International Journal of Qualitative Methods, 1* (3), 1-31.
Burton, A. W., & Miller, D. E. (1998). *Movement skill assessment.* Champaign, IL.: Human Kinetics.
Carmines, E, G., & Zeller, R. A. (1979). *Reliability and validity assessment*. Thousand Oaks, CA: Sage.
Connolly, K., & Bruner, J. (1973). Competence: Its nature and nurture. In K. Connolly y J. Bruner (Eds.), *The growth of ability* (pp.3-10). London: Academic Press.
Cermak, S.A., & Larkin, D. (2001). *Developmental Coordination Disorder*. Australia: DELMAR
Cratty, B.J. (1994). *Clumsy child syndromes: Descriptions, evaluation and remediation*. Switzerland: Harwood.
DeVellis, R. F. (2003). *Scale development: Theory and applications* (2ª ed.). Thousand Oaks, CA: Sage.
Gentile, A.M., Higgins, J.R., Miller, E.A., & Rosen, B.M. (1976). The structure of motor tasks. *Movement*, 7, 11-28
Gómez, M. (2005). *Problemas evolutivos de coordinación y percepción de competencia en el alumnado de primer curso de educación secundaria obligatoria en la clase de educación física.* Unpublished Doctoral Dissertation. Madrid: Complutense University of Madrid.
Henderson, S., May, D.S., & Umney, M. (1989). An exploratory study of goal setting behaviour, self-concept and locus of control in children with movement difficulties. *European Journal of Special Needs Education, 4* (1), 1-14
Henderson, S., & Sudgen, D. (1992). *Movement Assessment Battery for Children*. The Psychological Corporation. London: Harcourt Brace Jovanovich Publishers
Henderson, S.E. (1993). Motor development and minor handicap. En A. F. Kalverboer, B. Hopkins, & R. Geuze (Eds.), *Motor development in early and later childhood: Longitudinal approaches* (pp.286-306). Cambridge: Cambridge University Press
Keogh, J. & Sudgen, D. (1985). *Movement skill development.* New York: Macmillan
Knight, E., Henderson, S.E., Losse, A., & Jongmans, M. (1992). Clumsy at six clumsy at sixteen: The educational and social consequences of having motor difficulties in school. En T. Williams, L. Almond, & A. Sparkes (Eds.), *Sport and physical activity. Moving towards excellence*.(pp.249-259). London: E & FN Spon
Kurtz, L. (2003). *How to help a clumsy child. Strategies for young children with developmental motor concerns*. London: Jessica Kingsley Publishers
Losse, A., Henderson, S. E., Elliman, D., Hall, D., Knight, E., & Jongmans, M. (1991). Clumsiness in children –Do they grow out of it? A 10-year follow-up study. *Developmental Medicine and Child Neurology, 33*, 55-68.
Mandich, A., Polatajko, H. J., & Rodger, S. (2003). Rites of passage: Understanding participation of children with developmental coordination disorder. *Human Movement Science, 22*, 583-595.

Morris, P.R., & Whiting, H.T.A. (1971). *Motor impairment and compensatory education*. London: G. Bell & sons Ltd

Rasmussen, P., & Gillberg, C. (2000). Natural outcome of ADHD with developmental coordination disorder at age 22 years: A controlled, longitudinal, community-based study. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39* , 1424 –1431.

Ruiz, L.M. (1995). *Competencia Motriz*. Madrid: Gymnos

Ruiz, L.M. (2005). *Moverse con dificultad en la escuela. Introducción a los problemas evolutivos de coordinación motriz en la edad escolar*. Sevilla: Wanceullen.

Ruiz, L.M., Graupera, J.L. & Gutiérrez, M. (1997). *Problemas evolutivos de coordinación motriz y resignación aprendida en educación física*. Madrid: CIDE, Ministerio de Educación.

Schoemaker, M.M., & Kalverboer, A..F. (1994). Social and affective problems of children who are clumsy: how early do they begin?. *Adapted Physical Activity Quarterly*, 11:130-140.

Skinner, R.A. (2002). *Self-perceptions, perceived control and anxiety in children and adolescents al risk of developmental coordination disorder*. Tesis doctoral inédita. School of Psychology. Curtin university of technology.

Smyth, M.M., & Anderson, H.I. (2000). Coping with clumsiness in the school playground: social and physical play in children with co-ordination impairments. British Journal of Developmental Psychology, 18, 389-413.

Sugden, D., & Wright, H.C. (1998). *Motor coordination disorders in children*. Thousand Oaks, CA.: Sage

Tsalavoutas, I., & Reid, G. (2006). Competence satisfaction: Risk taking and achievement. *Adapted Physical Activity Quarterly*, *23*, 410-423

Treasure, D.C. (2001). Enhancing young people's motivation in youth sport: An achievement goal approach. In G.C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 79-100). Champaign, IL: Human Kinetics

White, R.W. (1956). Motivation reconsidered: The concept of ability. *Psychological Review*,.66, *5*, 297-323

Wright, H.C., Sudgen, D.A., Ng, R., & Tan, J. (1994). Identification of Children with movement problems in Singapore: Uselfulness of the Movement ABC Checklist. *Adapted Physical Activity Quarterly*, 11, *2*, 150-157