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Development of Circuit-Based Games According to Fundamental Motor Skill Activities for Dyspraxia Children

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Authors
Ramadhan N. [1] *MSc*
Nurhasan N.* [1] *PhD*
Indahwati N.[1] *MD*
Baqiyudin G.[1] *MSc*
Saifuddin H.[2] *MSc*
Mustaqim S.[3] *BSc*
Febrilia Perdanawati F.F.[2] *MSc*

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[1] Department of Sport and Health Sciences, Postgraduate School of Sport Science, State University Negeri Surabaya, Surabaya, Indonesia
[2] Department of Physical Education, Sport, Health and Recreation, Faculty of Educational Sciences, University Nahdlatul Ulama Sunan Giri, Bojonegoro, Indonesia
[3] Department of Tarbiyah Education, College of Science Tarbiyah Nahdlatul Ulama, Mojokerto, East Java, Indonesia

***Correspondence**
Address: Jalan Lidah Wetan, Kec. Lakarsantri, Surabaya, East Java, Indonesia. Postal Code: 60213
Phone: +0811347263
Fax: -
nurhasan007@unesa.ac.id

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ABSTRACT

Aims This study aimed to develop fundamental motor skill activities based on game circuits that aim to improve the motor skills of children with dyspraxia.
Instrument & Methods This research involved instrument development, initial revision, and field trials. Instruments in-game circuits were designed with various motor challenges specifically designed to facilitate the development of basic motor skills. In the initial trial phase, activities were implemented with the participation of several children with dyspraxia. Then, instruments and activities were adjusted based on feedback and findings from the initial trials. Field trials were conducted through the participation of larger groups of children with dyspraxia to evaluate the effectiveness and efficiency of the activities developed.
Findings The development of fundamental motor skill activity based on the game circuit has a CVR value of 0.5, greater than the threshold limit of 0.62. Hence, it had good content validity in measuring the desired construct. The correlation calculation results showed a positive and significant relationship between the scores of assessors 1, 2, and 3 with a total score of assessors on aspects of movement skills, cognitive aspects, fun aspects, and attention focus. The ICC test results showed the instrument's reliability.
Discussion Developing fundamental motor skill activities through the game circuit approach can effectively improve the motor skills of children with dyspraxia.

Keywords Activity Fundamentals Motor Skills; Circuit Games; Motor Skills; Childrens Dyspraxia

CITATION LINKS

[1] A development of number circuit game based learning strategy to introduce numeral symbols ... [2] Effectiveness of physical activity circuit model on endurance of ... [3] Development of mental training and playing circuit-based training ... [4] Problem-based collaborative learning model improves physical ... [5] Development of teaching model through circuit game to increasing children's ... [6] Fundamental motor skill among 6-year-old children in Padang ... [7] EThe relationship between sports and mental health: ... [8] Why teachers need to hear the voice and experience ... [9] Developmental dyspraxia in children with learning disorders: ... [10] Parent-carer awareness and understanding of dyspraxia: Implications for child ... [11] Physical activity in kindergarten, fundamental movement skills, and screen ... [12] Strategies to improve children's motor skills with special needs through circuit method based ... [13] A randomized controlled trial for children with childhood apraxia of speech comparing rapid ... [14] Athynos: Helping children with dyspraxia through an augmented ... [15] Developmental dyspraxia and the play skills of children ... [16] Effects of aerobic exercise and cognitively engaging exercise on ... [17] Effectiveness of activity based program in enhancing fine motor skills ... [18] Dyspraxia, motor function and visual-motor integration ... [19] Learning model of fundamental movement skills (FMS) for children ... [20] Model pengembangan keterampilan motorik my home environment terhadap anak disabilitas ... [21] Canadian agility movement skill assessment (CAMSA) in a Spanish context: evidences ... [22] Effects of physical exercise on gross motor skills in children with autism ... [23] Feasibiity and efficacy of a movement-training program on physical fitness, fundamental movement skills, and ... [24] Evaluating the developmental trajectories of fundamental movement skills across late childhood and ... [25] Beyond professional development: factors influencing early childhood educators' beliefs and practices working with dual ... [26] Stability of intelligence from preschool to adolescence: The influence of social and ... [27] Contemporary research on parenting: The case for ...

Introduction

Circuit games are a basic motion learning approach involving activities or exercises designed to train a child's basic motor skills [1, 2]. This circuit consists of several stations or posts, each targeting a different motor skill [3]. Children will move from one post to another in a certain order to practice various motor skills regularly [4]. Gaming circuits can be performed indoors or outdoors and adapted to the environment and available resources [5]. This approach can be a fun and engaging way to practice a child's basic motor skills and can help increase a child's self-confidence and social participation [6]. Children can improve their motor skills through structured and fun exercises and feel more confident participating in daily activities and social interactions [7].

Dyspraxia, or Developmental Coordination Disorder (DCD), is a condition that affects physical coordination in children [8]. This condition makes it difficult for children to carry out daily activities according to age and look awkward in movement. Although this condition often occurs in children, it can continue to affect their lives into adulthood [9]. Some of the symptoms of dyspraxia or DCD include difficulty coordinating movements, difficulty following instructions, difficulty writing, and difficulty speaking [10]. Although the terms dyspraxia and DCD are often used interchangeably, DCD is more commonly used by medical personnel because the term dyspraxia can have several meanings [11]. The diagnosis of dyspraxia or DCD should be made by competent medical personnel considering factors such as the child's medical history, motor skills, developmental achievements, and mental abilities [12]. Therapy and professional support can help children with dyspraxia or DCD develop their motor skills and cope with the challenges they face in everyday life [13].

Children with motor development disorders such as dyspraxia have difficulty developing basic motor skills. This disorder can affect their ability to participate in daily activities and social interactions. Therefore, developing fundamental motor skills in activity-based circuit games can potentially improve the motor skills of children with dyspraxia [14]. Children with dyspraxia have difficulty performing precision movements, coordination, and balance, which affects their participation in daily activities and social interactions. Some symptoms of dyspraxia in children include difficulty sitting, walking, making friends, and learning difficulties [15].

This encourages the need for effective intervention approaches to help children overcome their motor barriers [16]. The new thing in this research is to develop fundamental motor skill activities based on fun circuit games for students to improve children's motor skills and train the development of basic motor skills [17]. This study aims to investigate in more depth the effectiveness of such approaches in improving the motor skills of children with dyspraxia. Therefore, further research is needed to investigate the effectiveness of this approach and provide stronger evidence of its benefits for children with dyspraxia [18].

Several previous studies have explored the link between movement activities and learning difficulties. In addition, recent studies have shown that circuit games or smart circuit games can be one of the effective approaches in training the gross motor skills of children aged 5-6 years. The development of specialized game applications for mobile devices and online-based platforms has also gained attention to increasing the participation and motivation of children with dyspraxia in motor interventions. Although previous research differed on the focus and objectives of the study, it is important to seek professional help and support for children with dyspraxia to help them develop motor skills and cope with the challenges they face in everyday life.

Instrument and Methods

This study adopts a Research and Development (RnD) [19] approach to design an intervention program that aims to improve the motor skills of children with dyspraxia through fundamental motor skill activities based on game circuits.

The first stage in this RnD method was planning, in which the researcher details the steps necessary to develop the intervention program. It involves an in-depth understanding of the characteristics of children with dyspraxia, literature related to motor activity, and the use of game circuit technology. Next, the intervention program development steps will be designed, including the design of games, exercise sets, and other supporting components. After the planning stage, the second stage is the development stage. Here, the intervention program is created based on a pre-compiled design.

The game's circuit-based fundamental motor skill activities will be designed with the balance between children's learning goals and fun in mind [20]. Components such as game types, difficulty levels, exercise variations, and game interfaces will be carefully considered. The next stage is the implementation stage. The Intervention Program developed will be applied to the participant group of children with dyspraxia aged 6-10 years. During the implementation period, researchers will observe children's reactions and responses to the program and collect data related to their motor skills before and after participating in the program. After the implementation phase, the evaluation phase will be carried out. The data collected from the pretest and posttest tests will be analyzed to measure how this intervention program has successfully improved the motor skills of children with dyspraxia. In addition, input from children, teachers, or other relevant

parties will also be evaluated to assess the effectiveness and suitability of the intervention program.

The Denver Developmental Screening Test (DDST-II) is an evaluation tool with vertical lines depicting the child's age at the top and bottom. Concerning the child's age, a straight line is drawn from the top to the bottom at the age point of the child. This process helps determine which tests should be given to the child based on age. After the lines are drawn, the test results are determined based on the child's response to the test. There are three possible outcomes:

M (refuse): This result is given if the child refuses to perform the requested test movement. That is, the child refuses to perform the tasks given in the test.

G (failed): If the child is willing to perform the test movement, but does not meet the requirements for passing (success) the test, then this result is given. Despite the child's efforts, he cannot complete the test task according to the established criteria.

L (pass): If the child can carry out the test well and meets the requirements of passing the test, this result is given. That is, child successfully performs the test task according to the criteria established for his age.

Table 1. Expert validation sheet (development of fundamental motor skill activity based on the game circuit)

Games	Validation
First post: hand gross motion ability	0/1*
1- Throwing the ball: The ability to throw the ball with accuracy	0/1
2- Catching objects: The ability to catch objects thrown	0/1
3- Throwing the target: The ability to throw at the intended target	0/1
Second post: The ability of foot gross motion	
4- Standing on one leg: the ability to stand on one leg within a certain	0/1
5- The ability to walk by following	0/1
6- A straight-line jumping on command: The ability to jump according to instructions	0/1
Third post: the ability to fine eye-hand motion	
7- Inserting a rope into a hollow cube: The ability to insert a rope into a hole in the cube	0/1
8- Inserting a coin into a piggy bank: The ability	0/1
9- Creating an already patterned line: Ability to draw patterned lines	0/1
Fourth post: The ability of fine eye-hand movements in everyday life	
10- Using a spoon and fork: The ability to use a spoon and fork when eating	0/1
11- Cutting paper: The ability to cut the paper according to lines	0/1
12- Buttoning clothes: The ability to button clothes correctly	0/1
Total	0-12
Average value	0-1

*0→Disagree/1→Agree

The results of this test give an idea of the child's development in various motor and cognitive aspects at a given age. DDST-II chart with M, G, and L results helps identify areas of development that may require more attention or specific intervention for children who experience developmental barriers.

After obtaining the assessment from the four experts, the next step was to perform data analysis to evaluate the level of validity of the game circuit-based motor skill fundamental activity. Analysis was conducted using the Content Validation Index (CVI) and Content Validity Ratio (CVR) to assess the validity of the model's content. Field trials consist of two stages, namely small group trials and large group trials. In the small group Trial Phase, three students aged 5-6 years were involved; in the large group Trial Phase, four students aged 5-6 years were involved in Pelangi Harapan family planning.

Findings

The experts (A1, A2, A3) assessed with the same category on all items. Each expert scored 1 (agree) on the question item. The result of calculating the CVR for all question items is 0.5. In the context of the Coefficient of Validity Ratio (CVR), a value of 0.5 indicates that the question items have good content validity. The CVR value of 0.5 exceeds the threshold limit of 0.62, which is usually used to indicate sufficient content validity. This indicates that the experts agree and agree that the question items are relevant and correspond to the construct measured by the instrument. Thus, based on the experts' assessment (A1, A2, A3) and the results of the CVR calculation, it can be concluded that the instruments used have good validity in measuring the desired construct. The consistent assessment of experts on all question items indicated that the instrument was contentedly adequate in measuring the intended aspects.

Table 2. Correlation of each rater score with the final score in each aspect (all p values were less than 0.05) and the reliability of each aspect

Aspect	Rater	Correlation coefficient	Inter-rater coefficient
Movement Skill	Rater 1	0.728	0.881
	Rater 2	0.815	
	Rater 3	0.765	
Cognitive Skill	Rater 1	0.782	0.721
	Rater 2	0.586	
	Rater 3	0.691	
Fun	Rater 1	0.722	0.623
	Rater 2	0.621	
	Rater 3	0.673	
Focus Attention	Rater 1	0.624	0.633
	Rater 2	0.713	
	Rater 3	0.637	

The correlation calculation results showed a positive and significant relationship between the scores of assessors 1, 2, and 3 with a total score of assessors on aspects of movement skills, cognitive aspects, fun

aspects, and attention focus. The ICC test results showed the instrument's reliability (Table 2).

A small group trial showed that different learning models gaming circuits effectively improved students' movement skills, cognitive skills, excitement, and attention focus. In small groups, there are three categories of assessment of the results of the Developmental Screening Test II that can provide an idea of students' development level. First, there is a "reject" group of 8 individuals. This category reflects that some of them show significant rejection responses or difficulties in dealing with some aspects of the development tested (Table 3).

Certain factors may prevent them from coping well with such tasks. Then, there was a "failed" group with 16 individuals. This category indicates that they have not achieved the expected development standards in certain areas tested. This can be due to various factors, including the level of maturity or ability of the individual to cope with the tasks at hand. On the other hand, the largest group was "graduated" with 31 individuals. Individuals in this category have successfully achieved or even exceeded the level of development considered appropriate in this test. These results show that they have good skills and abilities in various aspects of development tested.

Table 3. Developmental screening test results II (Small Group)

Assessment Instrument	Number of Students		
	1	2	3
1. An example of a vertical line	M	M	L
2. Cube Tower	L	L	L
3. Thumb wiggling	L	L	L
4. Following the example of the circle	G	G	L
5. Draw a three-part person	G	L	G
6. Removing the + sign	M	M	L
7. Choosing a longer line	L	L	l
8. The example of the square	L	L	L
9. Drawing people in six parts	G	G	L
10. Skip far	G	L	G
11. Stand 1 foot 1 second	M	M	L
12. Stand 1 foot 2 seconds	L	L	L
13. Jumping on one leg	L	L	L
14. Stand 1 foot 3 seconds	G	G	L
15. Stand 1 foot 4 seconds	G	L	G
16. Stand 1 foot 5 seconds	G	G	L
17. Walk by bridging the heel to the toes	G	L	G
18. Stand on one leg for 6 seconds	L	L	L
Total	M/Rejected: 8; G/Failed: 16; L/Passed: 31		

Table 4. Developmental screening test results II (Large Groups)

Assessment Instrument	Number Of Students						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1. An example of a vertical line	M	M	L	L	G	M	G
2. Cube Tower	L	L	L	G	G	M	M
3. Thumb wiggling	L	L	L	L	L	L	L
4. Following the example of the circle	G	G	L	M	M	L	L
5. Draw a three-part person	G	L	G	L	G	L	G
6. Removing the + sign	M	M	L	L	G	M	G
7. Choosing a longer line	L	L	L	G	G	M	M
8. The example of the square	L	L	L	L	L	L	L
9. Drawing people in six parts	G	G	L	M	M	L	L
10. Skip far	G	L	G	L	G	L	G
11. Stand 1 foot 1 second	M	M	L	L	G	M	G
12. Stand 1 foot 2 seconds	L	L	L	G	G	M	M
13. Jumping on one leg	L	L	L	L	L	L	L
14. Stand 1 foot 3 seconds	G	G	L	M	M	L	L
15. Stand 1 foot 4 seconds	G	L	G	L	G	L	G
16. Stand 1 foot 5 seconds	G	G	L	M	M	L	L
17. Walk by bridging the heel to the toes	G	L	G	L	G	L	G
18. Stand on one leg for 6 seconds	L	L	L	G	G	M	M
Total	M/Rejected: 25; G/Failed: 38; L/Passed: 63						

In the analysis of large groups, three assessment categories provide deep insight into the development of the group. First, there is a group of "Rejects" with the participation of 25 individuals. This number appears to be higher than that seen in small groups, perhaps reflecting a more even distribution of challenges or barriers to development in these large groups. Most likely, some aspects of development show more common difficulties among most students in this group. Secondly, the "failed" group had the participation of 38 individuals. The number of individuals who do not reach developmental standards in this large group is also higher. This may indicate that many students may face delays or disabilities in some aspects of development tested by DST-II. The large variation in these categories most

likely reflects a broader development spectrum among these individuals. Finally, the "graduated" group had the participation of 63 individuals. This number is greater than that of the small group, indicating that most individuals in this large group have achieved or even exceeded the developmental standards measured by DST-II. This illustrates that most students have demonstrated good skills and abilities in the various aspects of development tested (Table 4).

Discussion

The number of students in the "reject", "fail," and "pass" categories indicates that each individual has a different pace and ability to cope with the development tasks tested. A greater number of students in the categories of "reject" and "fail" in large groups may indicate a more general challenge or obstacle to development in this environment. Factors such as environment, background, or other differences can affect a student's ability to achieve expected development [21]. The "Reject" and "fail" results provide valuable information about areas that require further attention and support [22]. Discussions about how to provide more intensive, individualized, or focused learning opportunities in areas that need improvement can be an important part of this analysis. "Graduated" results indicate that many students have achieved or exceeded the development standards measured by DST-II. This shows that there are skills that have been mastered well by most students. This point can be the basis for designing a curriculum that is more challenging or involves more complex skills [23]. These results emphasize the importance of an individualized and responsive learning approach to each student's needs and abilities [24]. An adaptable approach can help address challenges and maximize each student's development potential by understanding the variation in outcomes. These results provide the basis for collaboration between teachers and parents. Teachers can use this information to design more effective learning plans, while parents can support their child's development at home by understanding areas that need more attention. These results can serve as a basis for further research on the factors that influence student development in the context of large groups. Further research may dig deeper into these factors and may provide further insight into how to improve development outcomes.

The study results describe the variation in the development of students in large groups, which can be influenced by several interrelated factors [25]. These factors include differences in individual factors such as genetics, physical health, and maturity levels that may affect different levels of development [26].

In addition, socio-economic backgrounds can also have a significant impact, where access to stimulating environments and adequate educational resources may vary. The school environment, including teaching methods, educational approaches, and interactions between students and teachers, can also play an important role in shaping student developmental outcomes [27]. Mental and emotional health, family support, and the availability of learning resources can also affect students' ability to cope with developmental tasks. These factors interact with each other and form a complex background, which may explain significant variations in this study's results.

Therefore, a holistic and responsive approach to individual needs and contexts is essential in supporting the development of students in these large groups. Nonetheless, more research is needed to confirm these findings and perhaps develop more specific and focused approaches to address the challenges faced by children with dyspraxia. The results of this study have important practical implications, especially in the context of special education and rehabilitation. Teachers, therapists, and parents may consider using a gaming circuit-based fundamental motor skill activity approach as part of an intervention program for children with dyspraxia. This approach can help create a more engaging and fun learning environment while still focusing on developing the required motor skills.

Conclusion

The development of fundamental motor skill activity based on gaming circuits has great potential to improve children's motor skills with dyspraxia. These interventions can positively impact various aspects of children's basic motor skills, which in turn can help them participate in daily activities and social interactions.

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References

1- Ningsih RW, Suyanto S, Fahmi F. A development of number circuit game based learning strategy to introduce

numeral symbols for children aged 4-5 years. Mitra Ash-Shibyan J. Pendidik. Dan Konseling. 2021;4(1):47-58.
2- Mylsidayu A, Tangkudung J, Hanif AS. Effectiveness of physical activity circuit model on endurance of elementary school students. Dordrecht: Atlantis Press; 2020.
3- Astuti Y, Bakhtiar S, Barlian E, Gistituati N. Development of mental training and playing circuit-based training programs on volleyball materials. J. High. Educ. Theory Pract. 2022;22(12):244.
4- Endrawan IB, Aliriad H. Problem-based collaborative learning model improves physical education learning outcomes for elementary school students. 2023;11(1):9-17.
5- Khasanah I, Sutapa P. Development of teaching model through circuit game to increasing children's gross motor ability. Dordrecht: Atlantis Press; 2018. pp. 138-146.
6- Bakhtiar S. Fundamental motor skill among 6-year-old children in Padang, West Sumatera, Indonesia. Asian Soc. Sci. 2014;10(5):155-8.
7- Endrawan IB, Aliriad H, Apriyanto R, Da'I M, Adi S, Cahyani OD, et al. The relationship between sports and mental health: literature analysis and empirical study. Heal Educ Heal Promot. 2023;11(2);1001-11.
8- Edmonds C. Why teachers need to hear the voice and experience of the child with dyspraxia. Res Teach Educ. 2013;3(1):5-10.
9- Waber DP, Boiselle EC, Yakut AD, Peek CP, Strand KE, Bernstein JH. Developmental dyspraxia in children with learning disorders: Four-year experience in a referred sample. J Child Neurol. 2021;36(3):210-21.
10- Pedro A, Goldschmidt T, Daniels L. Parent-carer awareness and understanding of dyspraxia: Implications for child development support practices. J Psychol Africa. 2019;29(1):87-91.
11- Carballo-Fazanes A, Díaz-Pereira MP, Fernández-Villarino MA, Abelairas-Gómez C, Rey E. Physical activity in kindergarten, fundamental movement skills, and screen time in Spanish preschool children. Psychol Sch. 2023;60(9):3318-28.
12- Jariono G, Yunita P, Gontara SY, Nugroho H, Maslikah U. Strategies to improve children's motor skills with special needs through circuit method based inclusion education. Kinestetik J Ilm. Pendidik. Jasm. 2023;7(2):434-40.
13- Murray E, McCabe P, Ballard KJ. A randomized controlled trial for children with childhood apraxia of speech comparing rapid syllable transition treatment and the Nuffield Dyspraxia Programme–Third edition. J Speech Lang Hear Res. 2015;58(3):669-86.
14- Avila-Pesantez D, Vaca-Cardenas L, Rivera LA, Zuniga L, Avila LM. Athynos: Helping children with dyspraxia through an augmented reality serious game. 2018 International Conference on eDemocracy & eGovernment (ICEDEG); 2018 Apr 14-16; IEEE Xplor. p. 286-90.
15- Bodison SC. Developmental dyspraxia and the play skills of children with autism. Am J Occup Ther. 2015;69(5):6905185060.
16- van der Fels IMJ, Hartman E, Bosker RJ, de Greeff JW, de Bruijn AGM, Meijer A, et al. Effects of aerobic exercise and cognitively engaging exercise on cardiorespiratory fitness and motor skills in primary school children: A cluster randomized controlled trial. J Sports Sci. 2020;38(17):1975-83.
17- Kareem J. Effectiveness of activity based program in enhancing fine motor skills of children with dyspraxia. Sch Int J Multidiscip Allied Stud. 2015;5(2).
18- Miller M, Chukoskie L, Zinni M, Townsend J, Trauner D. Dyspraxia, motor function and visual-motor integration in autism. Behav Brain Res. 2014;269:95-102.
19- Kesumawati SA, Fakhruddin, Fahritsani H. Learning model of fundamental movement skills (FMS) for children with mild intellectual disability. Int J Hum Mov Sport Sci. 2021;9(1):71-80.
20- Satria MH, Aliriad H, Kesumawati SA, Fahritsani H, Endrawan IB, Adi S. Model pengembangan keterampilan motorik my home environment terhadap anak disabilitas intelektual. J Obs J Pendidik Anak Usia Dini. 2023;7(2):2336-47.
21- Menescardi C, Villarrasa-Sapiña I, Lander N, Estevan I. Canadian agility movement skill assessment (CAMSA) in a Spanish context: evidences of reliability and validity. Meas Phys Educ Exerc Sci. 2022;26(3):245-255.
22- Castaño PRL, Suárez DPM, González ER, Robledo-Castro C, Hederich-Martínez C, Cadena HPG, et al. Effects of physical exercise on gross motor skills in children with autism spectrum disorder. J Autism Dev Disord. 2023; pp. 1–10, 2023.
23- Masteller B. Feasibiity and efficacy of a movement-training program on physical fitness, fundamental movement skills, and physical activity in third and fourth grade students. Massachusetts: University of Massachusetts Amherst; 2018.
24- Hill P. Evaluating the developmental trajectories of fundamental movement skills across late childhood and adolescence. Swansea: Swansea University; 2022.
25- Spies TG, Lyons C, Huerta M, Garza T, Reding C. Beyond professional development: factors influencing early childhood educators' beliefs and practices working with dual language learners. Catesol J. 2017;29(1):23-50.
26- Sameroff AJ, Seifer R, Baldwin A, Baldwin C. Stability of intelligence from preschool to adolescence: The influence of social and family risk factors. Child Dev. 1993;64(1):80-97.
27- Collins WA, Maccoby EE, Steinberg L, Hetherington EM, Bornstein MH. Contemporary research on parenting: The case for nature and nurture. Am Psychol. 2000;55(2):218-32.