

A Cross-Lagged Model of the Social withdrawal and Peer Relationships in Obese Children

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Abstract: This study uses cross-lagged path modeling to examine the longitudinal associations between obese children's social withdrawal and peer relationships. Participants were 75 school-aged children from Korea, who were reported to be obese in the 4th grade. The participants belonged to the first elementary school cohort panel of the KCYPS. The 3-year longitudinal data collected from 4th grade, 6th grade, and 7th grade students were used in this study. Social withdrawal and peer relationships were continued from 4th grade to 7th grade with significant stability. Peer relationships from Elementary school to Middle school were consistently predicted by previous social withdrawal tendencies. Likewise, social withdrawal has a significant predictive effect on subsequent peer relationships. The findings suggest the importance of psychological interventions with obese children, to reduce the negative influence of social withdrawal on peer relationships.

Keywords: Social withdrawal; Peer relationships; Obese Children; Cross-Lagged Model; KCYPS

1. Introduction

Obesity is the accumulation of excess fat in fatty tissues to the point of it damaging health [1]. Adult obesity is a type of fat cell size increase; however, childhood obesity is a type of increase in the number of fat cells. As the number of fat cells is hard to reduce, the seriousness of childhood obesity is beginning to be understood [2]. The number of obese children is increasing in Korea due to eating habits, lack of exercise, and excessive stress from hard studying. The prevalence of obesity among elementary school students in Korea was only 2%–3% in 1970 [3]; however, it was 10.1% in 2016 and 2017 in Korea [4]. The rate of obesity among elementary school students is much higher than that of middle and high school students in Korea [5]. The Centers for Disease Control and Prevention of USA said the prevalence of obesity in children has more than doubled for young children and quadrupled for adolescents over the past 30 years [6].

Children's obesity not only harms immediate children's health, but can also cause persistent health problems into adulthood [7]. Furthermore, obese children tend to have a lower self-perception and negative body image. And they show even a higher percentage of psychiatric problems [6]. The internal emotional instability caused by lower self-esteem and negative judgment on their self-image make obese children engaging in negative peer interaction. About 30% of obese children were found to have been teased by their family and 57.3% of their friends [8]. 'Lookism'—which is discrimination against a person on the ground of physical appearance [9]—is rapidly spreading among elementary school students; obese children tend to be made fun of by their peers, suffering from emotional discomfort and low self-esteem, and they may even have difficulty in making good relationships with peers. Obese children are prone to being ridiculed, branded, and isolated by their peers.

Social withdrawal refers to a tendency to cringe or become nervous when meeting a new person or encountering a strange environment, making it difficult for children to build a comfortable relationship with the people around them [10]. Social withdrawal is caused by internal factors such as difficult temperament, anxiety, low self-esteem, and lack of social skills [11], or caused by inadequate parenting [12]. Socially withdrawn children are prone to refraining from social interaction with peers [10], and have difficulty in acting naturally or expressing themselves in front of strangers, therefore, these children may lose the opportunity for positive adjustment and growth [13]. Moreover, the social withdrawal problem of childhood was found to predict early adult depression and showed a potential path of early social difficulties leading to subsequent diagnoses of depression [14]. The obese children were likely to be isolated from peers, they were worried about being teased and feeling awkward because of their appearance. Therefore, obese children with social withdrawal also choose to be alone without being mixed into peer groups.

Elementary school students spend much of their day at schools and academies, and gradually widen their social network from their parents to peers and other adults, which has an important impact on the overall development of children as well as their school adaptation [15]. Unlike relationships with parents or teachers, peer relationships, in particular, are a horizontal relationship with egalitarian interactions and have a profound impact on child's development. Besides, the amount and quality of peer relationships changes dramatically during the elementary school years—as children meet more diverse groups of peers [16]. As peers are a major source of intimacy and belonging in this period [17], children who maintain good relationships with peers are psychologically more stable and happier.

Studies on children's social withdrawal have addressed the cause and the developmental outcome of social withdrawal [18,19]. The negative relationship with peers was found to deepen the problem of social withdrawal in midterm childhood; however, the secure attachment to peers as well as the positive peer relationships was found to reduce social withdrawal [18,19]. Longitudinal studies have reported that the social withdrawal behavior and peer rejection experience remains stable from early childhood to midterm childhood [15, 19, 20], and social withdrawal is closely associated with peer relationships [21]. Meanwhile, longitudinal studies on children's social withdrawal showed that not all depressed children experienced psychological or emotional difficulties or continued to strengthen social withdrawal after time [22,23]. Though studies concerning the longitudinal effects of youth social withdrawal on adolescent behavior [15,24] have recently been conducted in Korea, few studies have been done on obese children yet. Obese children's psychological factors play a role of obstacles or supports in their efforts for a healthier lifestyle [25]. Child obesity is associated with lower self-esteem and self-concept [26], which makes obese children withdrawn and isolated from peers. Therefore, this study aims to identify the longitudinal changes in how the social withdrawal and peer relationships of obese children change over time and how this change affects obese children's later social withdrawal and peer relationships.

2. Methods

2.1. Sampling and data collection

The participants were 75 children—47 boys (62.7%) and 28 girls (38.3%)—who were reported as obese in the 4th grade. Participants are 12 to 14 years old ($M=12.98$; $SD=.17$) when in the 4th grade. A survey was conducted for participants from 4th to 6th and 7th grades belonging to the first-grade elementary school cohort panel of the Korean Children and Youth Panel Survey (KCYPS) [27]. This study used the data collected by the KCYPS from 2013 through 2016. To be included in this study, children belonging to the 1st-grade elementary school cohort panel had to have provided all the necessary information at 3 time points: the 4th grade (wave 1); 6th grade (wave 2); 7th grade (wave 3).

2.2. Measurement

2.2.1 Social withdrawal

The social withdrawal scale of Kim Sun-Hee and Kim Kyung-Yeon [28] was modified and used. Social withdrawal is a behavior or attitude that isolates oneself from the surrounding environment or people, and consists of five questions, such as 'I feel awkward when there are many people around me'. Each question is rated on a four-point Likert scale. The higher their score, the higher the social withdrawal tendency of the subject. The Cronbach's alpha coefficients of the 4th, 6th, and 7th grade were .89, .90, and .88 each. In the model analysis, social withdrawal consisted of two measurement variables to be latent variables to decrease the number of measurement variables [29].

2.2.2 Peer Relationship

The peer adjustment subscale in the School Adjustment Scale was used to measure the peer relationship of obese children. The school adjustment scale developed by Min Byung-Soo [30] was composed of 4 subclasses; school learning, school rules, peer relationships, and teacher relationships at school. The Peer Relationships subscale measures the degree of good relationships maintained with peers and consists of 5 items. The Cronbach's alpha coefficients of the 4th, 6th, and 7th grade were .72, .78, and .78 each. Peer Relationship consisted of two measurement variables to be latent variables to minimize error [29].

2.4 Ethical consideration

Ethical approval for this study was obtained from the Institutional Review Board of the Namseoul University (IRB No.1041479-HR-202002-001), Cheonan, Korea.

2.5 Data analysis

To examine reciprocal influences on peer relationships and social withdrawal, an autoregressive cross-lagged (ARCL) panel model approach was used. To examine the ARCL model, the order of analyses has to satisfy measurements invariance, paths invariance, and error covariance invariance. The test of measurement invariance is performed to measure whether the concept is measured the same at each time point or measuring the changes in the concept over time [31]. The test of equality of autoregressive paths and cross-lagged paths are conducted to verify whether the regression coefficients for each observed variable are stable over time [32]. The test of error covariance invariance is to equally constrain covariance between the errors of the variables. These nested tests can be used to investigate whether these constraints are reasonable. The degree of model fit was assessed. The cross-lagged panel analyses were conducted with AMOS ver. 20.0.

3. Results

3.1. Descriptive Statistics and Correlation

Table 1 shows the participants characteristics. Table 2 shows descriptive statistics of social withdrawal and peer relationships. With a possible score ranging from 1 to 4, social withdrawal on average ranges from 2.00 to 2.21 across three time points. The peer relationship, on average, ranges from 3.11 to 3.17 across three time points. The value of the skewness and Kurtosis of social withdrawal and peer relationships support the assumption of a normal distribution of the data [33].

Table 1. Characteristics of participants (N=75)

Title 1	Range	M(SD)
Age (year)	12-14	12.98(.17)
Height (cm)	130–160	144.53
Weight (kg)	35–64	47.55
Perceived health status	1–3	1.77(.55)
Gender (N, %)	Boys (47, 62.7), girls (28, 37.3)	

Table 2. Descriptive statistics of social withdrawal and peer relationships

	Range (Min- Max)	M(SD)	Skewnes s	Kurtosis
social withdrawal 4 th	1–4	2.00(.78)	.66	-.12
social withdrawal 6 th	1–4	2.21(.82)	.27	-.66
social withdrawal 7 th	1–4	2.17(.78)	.12	-.66
peer relationship 4 th	2–4	3.11(.53)	.00	-.47
peer relationship 6 th	1.50–4	3.18(.47)	-.29	1.25
peer relationship 7 th	1–4	3.17(.49)	-.85	4.41

Table 3 shows the interrelations for the social withdrawal and peer relationship in obese children at each assessment. The social withdrawal and peer relationship had been moderately stable over the years, with r values of >0.4 . Also, there were significant interrelations between social withdrawal and peer relationships at the same point, with r values of -0.24 to -0.42 .

Table 3. Mean, SDs, and intercorrelations among social withdrawal and peer relationships.

	Social withdrawal 4 th	Social withdrawal 6 th	Social withdrawal 7 th	Peer relationship 4 th	Peer relationship 6 th
Social withdrawal 6 th	.50***	1			
Social withdrawal 7 th	.38**	.46**	1		
Peer relationship 4 th	-.24*	-.32**	-.23*	1	
Peer relationship 6 th	-.37**	-.42***	-.34**	.46***	1
Peer relationship 7 th	-.33**	-.42***	-.25*	.42***	.51***

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

3. 2. ARCL(Autoregressive and cross-lagged) Modeling

A cross-lagged effect is the effect of one variable on another, after being controlled for their stability over time [34]. The model was to examine the reciprocal relationships between social withdrawal and peer relationships in obese children over a total of three time points.

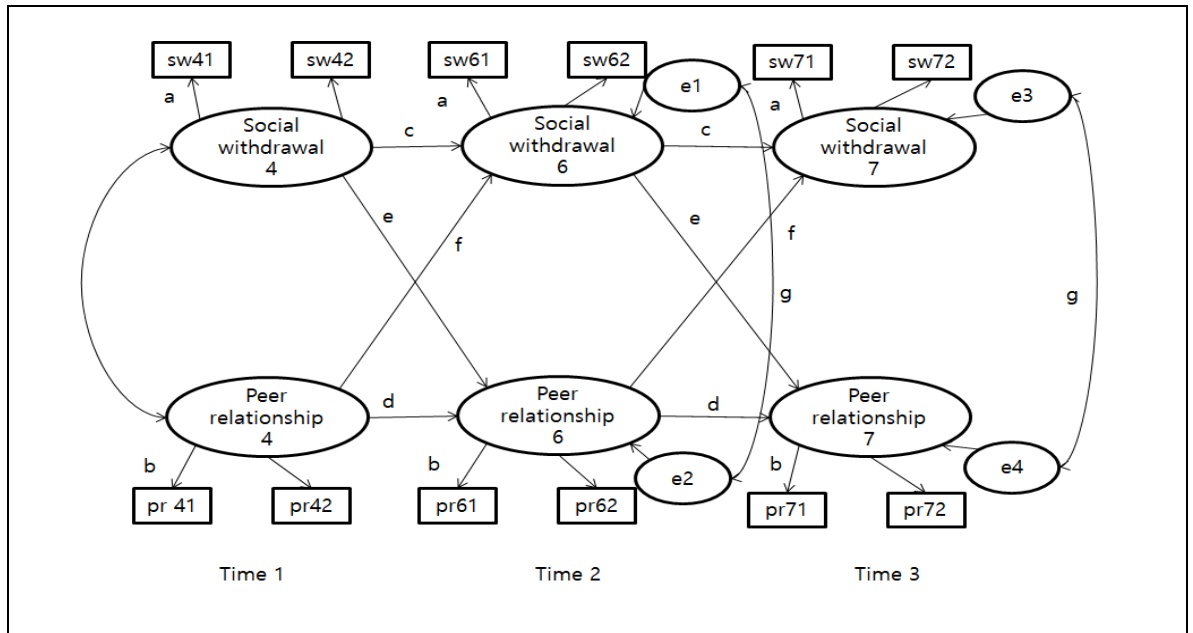


Figure 1. The ARCL(Autoregressive and cross-lagged) model was employed to test for the reciprocal relationships between social withdrawal and peer relationship.

Our hypothesized model (see Fig. 1) assumes that prospective relationships between social withdrawal and peer relationships are stable over time. To test the equality of the factor loadings, paths, and error covariance, the following eight competitive models were developed;

- Model 1: No constraint to the basic model
- Model 2: The model with equality constraints to the factor loading (A) of social withdrawal
- Model 3: The model with equality constraints to the factor loading (B) of social withdrawal
- Model 4: The model with equality constraints to the autoregressive coefficient (C) of social withdrawal
- Model 5: The model with equality constraints to the autoregressive coefficient (D) of peer relationships
- Model 6: The model with equality constraints to the cross-regression coefficient (E) of social withdrawal
- Model 7: The model with equality constraints to the cross-regression coefficient (F) of peer relationships
- Model 8: The model with equality constraints to the error coefficient (G) of social withdrawal and peer relationship.

To verify the optimal model, statistical analyses for each model were carried sequentially. As each model was nested, χ^2 tests were conducted to compare the models. χ^2 tests were sensitive to the sample size [35]; however, other goodness-of-fit indices were used. Table 4 reports summary fit statistics (χ^2 , CFI, TLI, RMSEA) for the eight tested models (M1—M8). All the models showed a good fit to the data (Table 4). If the fit indices didn't worsen with an additional constraint, the equality of measurement, autoregressive paths, cross-lagged paths, and correlated errors were established. The constraints were added to the paths A–G, however, the fit indices did not get worse (Table 4). Compared with Model 7, Model 8 did not indicate a significant difference in fit indices. Therefore, Model 8 was chosen as the final model considering model simplicity.

Table 4. Comparison of the autoregressive cross-lagged models

Model	χ^2	df	p	RMSEA	IFI	CFI	Comparison	$\Delta\chi^2$	Δdf
M 1	63.37	42	.02	.08	.92	.96			
M 2	65.32	45	.03	.08	.92	.96	M1–M2	1.95	3
M 3	66.61	47	.03	.08	.93	.96	M2–M3	1.29	2
M 4	66.71	48	.04	.07	.93	.96	M3–M4	.10	1
M 5	66.75	49	.05	.07	.94	.96	M4–M5	.04	1
M 6	67.08	50	.05	.07	.94	.96	M5–M6	.33	1
M 7	67.08	51	.06	.07	.95	.97	M6–M7	.00	1
M 8	68.21	52	.07	.07	.95	.97	M7–M8	1.13	1

Table 5 and Figure 2 demonstrated that Social withdrawal ($\beta = .37$, $\beta = .41$, $p < .001$) and peer relationship ($\beta = .59$, $\beta = .48$, $p < .001$) in obese children are highly stable over time. Higher social withdrawal at Time 1 leads to lower peer relationships at Time 2. This pattern remains true for peer relationships at Time 2, leading to lower peer relationships at Time 3.

An analysis of the cross-lagged effects between the two variables indicated that the social withdrawal of obese children at a previous point had a significant negative relationship with their peer relationships at the next point ($\beta = -.22$, $\beta = -.21$, $p < .05$), and that peer relationships at a previous point in obese children were negatively associated with social withdrawal at the next point ($\beta = -.38$, $\beta = -.36$, $p < .05$). The results indicated that the influence of peer relationships on social withdrawal was significantly higher than the influence of social withdrawal on peer relationships in obese children.

Table 5. Overview of the standardized stability and cross-lagged coefficients

Autoregressive path	b(β)	S.E.	Cross-lagged path	b(β)	S.E.
SW _{T1} --> SW _{T2}	.38(.37)***	.08	SW _{T1} --> PR _{T2}	-.13(-.22)*	.05
SW _{T2} --> SW _{T3}	.38(.41)***	.08	SW _{T2} --> PR _{T3}	-.13(-.21)*	.05
PR _{T1} --> PR _{T2}	.53(.59)***	.10	PR _{T1} --> SW _{T2}	-.60(-.38)***	.15
PR _{T2} --> PR _{T3}	.53 (.48)***	.10	PR _{T2} --> SW _{T3}	-.60(-.36)***	.15

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

SW: Social withdrawal, PR: Peer relationship, T1: 4th grade, T2: 6th grade, T3: 7th grade.

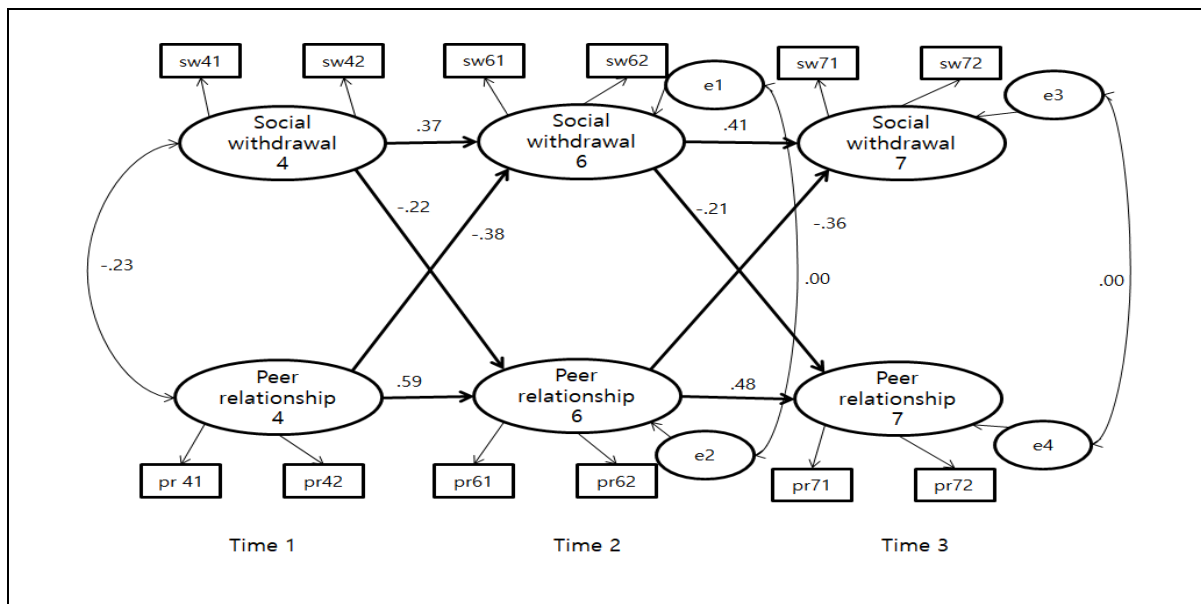


Figure 2. The final model.

4. Discussion

This study aimed to understand the association between social withdrawal and peer relationships in obese children. Thus, we utilized autoregressive, cross-lagged analyses to determine autoregressive and cross-lagged effects between these two constructs.

Firstly, social withdrawal among obese children measured at each point was stable over time. The obese children’s social withdrawal at the previous point significantly effects their social withdrawal at next point. Many studies have shown that obese children tend to have negative views of their appearance, which make them averse to socializing with others, and these views are likely to worsen. Previous studies have suggested obese children are prone to have problematic social functioning [25, 36]. Children’s social withdrawal is closely linked to negative feelings about themselves, low self-esteem, depression [37], and subsequent social and emotional adjustment [10,13,14]. Social withdrawal among obese children can be fostered by their temperament or environmental factors [38,39]. It is hard to reduce social withdrawal through a child's own effort if the social withdrawal is due to innate characteristics such as temperament. Therefore, intervention from significant others could be helpful in reducing children’s social withdrawal; parents, teachers, and close friends of obese children need to wait and support them to adapt in new or unfamiliar situations, and to help them develop appropriate skills to interact with others.

Secondly, peer relationships among obese children were stable over time. The obese children’s peer relationships at the previous point significantly influenced later peer relationships. The results of this study confirm the stability of friendship [40]. Friendship is more important than any other social relationship as children grow up. It does not seem to have a negative effect for those obese children who could form good friendships with peers from the beginning. However, obese children who could not form close friendships with peers are more likely to have difficulty in forming friendships continuously, even after that. The importance of early intervention to improve peer integration for obese children has been suggested.

Third, the effect of social withdrawal on peer relationships was significant. Furthermore, the effect of social withdrawal on peer relationships endured over time. This result supports several previous studies showing that social withdrawal hurts peer relationships [14,15,18,43, 44, 45]. Withdrawn children are reported to be anxious and have difficulties making new friends because it takes more time to adapt to unfamiliar situations. When interpreting this finding, however, the psychological traits of obese children should be

considered. Nonsocial attributes like physical attractiveness have been reported to be a stressful factor in determining peer relationships [41]. Therefore, health education to protect and treat childhood obesity in school should be provided; including nutrition education, steady physical exercise, and psychological programs for developing positive self-images.

Lastly, the effect of peer relationships on social withdrawal was significant. As the quality of peer relationships increases, social withdrawal decreases. The impact of peer relationships on social withdrawal remained stable for the three years. The important thing is that the quality of previous peer relationships affects the later social withdrawal; the quality of peer relationships continuously affects any subsequent personality traits. Many studies showing that the parent–child relationship was the foundation of the child's personality have been conducted [42]. Moreover, this study confirms that the quality of peer relationships form the basis of children's personality traits. Therefore, obese children must learn the attitude and skills to form and maintain good friendships to reduce psychological withdrawal.

This study is meaningful in that it reveals the correlation between the social withdrawal of obese children and the stability of peer relationships over time, and between social withdrawal and peer relationship using longitudinal data. However, there is a limit to this study, in that the environmental and psychological variables that could affect the peer relationship of obese children were not considered enough. In future studies, it is expected that the developmental trajectory of the peer relationship of obese children will be traced by dealing with the characteristics of parents and the personal characteristics of obese children.

5. Conclusions

This study aimed to test for reciprocal relationships between social withdrawal and peer relationships among obese children. The social withdrawal and the quality of peer relationships among obese children tended to continue over time. The social withdrawal of obese children predicted subsequent changes in peer relationships, and the quality of peer relationships predicted subsequent changes in social withdrawal also.

These results support the importance of early intervention to improve obese children's social development. Collaboration between parents, teachers, and peers is necessary for to help obese children to learn how to form and maintain friendships to reduce social withdrawal, and how to access peers to maintain good peer relationships.

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References

1. World Health Organization. Obesity: Preventing and managing the global epidemic. Report of a WHO Consultation. Geneva, 2000. Available online: https://www.researchgate.net/profile/Sebastiao_Almeida3/publication/273291964_Imagem_Corporal_Ansiedade_e_Depressao_em_Mulheres_Submetidas_a_Cirurgia_Bariatrica/links/55f1c5a308ae199d47c475c7.pdf (accessed on 10 December 2019).
2. Wong, D. L.; Rollins, J. H.; Whaley, L. F. *Whaley & Wong's essentials of pediatric nursing*, 4th ed.; Mosby-Year Book: St. Louise, MO, 1993.
3. Kang, Y. J.; Suh, I.; Hong, C. H.; Park, J. K. Twelve-year Study on Body Mass Index Changes of Obese Adolescents. *J Prev Med and Public Health*. **1994**, *27*, 665-676. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=A101437084> (accessed on 10 December 2019).
4. Korea Centers for Disease Control & Prevention. 2017 National Health Statistics. Seoul: Korea Centers for Disease Control & Prevention, 2019. Available online:

- https://knhanes.cdc.go.kr/knhanes/sub04/sub04_03.do?classType=7 (accessed on 15 December 2019).
5. Ministry of Education, 2019. Available online: <https://www.moe.go.kr/boardCnts/view.do?boardID=294&boardSeq=77144&lev=0&searchType=null&statusYN=W&page=1&s=moe&m=020402&opType=N> (accessed on 13 November 2019).
 6. Powell, F. *Childhood obesity: Getting back to the basics*. Scholarship Repository, University of San Francisco: San Francisco, CA, 2019; pp. 1-15.
 7. Centers for Disease Control and Prevention. *Childhood obesity causes & consequences*, 2016. Available online: <https://www.cdc.gov/obesity/childhood/causes.html> (accessed on 10 December 2019).
 8. Lee, K. M.; Im, N. S. The influence of obesity index and body-shape perception on the self-concept of high graders in elementary school. *The Korean Journal of the Elementary Physical Education*. **2003**, 9, 57-74. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=A82617099> (accessed on 10 December 2019).
 9. Collinsdictionary, 2019. Available online: <https://www.collinsdictionary.com/dictionary/english/lookism> (accessed on 13 August 2019).
 10. Rubin, K. H.; Coplan, R. J.; Bowker, J. C. Social withdrawal in childhood. *Annual review of psychology*. **2009**, 60, 141-171. Available online: <https://doi.org/10.1146/annurev.psych.60.110707.163642> (accessed on 13 November 2019).
 11. Rubin, K. H.; Asendorpf, J. B. *Social withdrawal, inhibition and shyness in childhood*; Psychology Press: Hove, UK, 2014.
 12. Rubin, K. H.; Burgess, K. B.; Kennedy, A. E.; Stewart, S. L. *Social withdrawal and inhibition in childhood*. In Mash, E. J.; Barkley, R. A. (Eds.), *Child Psychopathology*, 2nd ed.; Guilford Press: New York, NY, 2003; pp. 372-406.
 13. Rubin, K. H.; Wojslawowicz, J. C.; Rose-Krasnor, L.; Booth-LaForce, C.; Buress, K. B. The best friendships of shy/withdrawn children: Prevalence, stability, and relationship quality. *J Abnorm Child Psychol*. **2006**, 34, 139-153. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=O44788617> (accessed on 10 December 2019).
 14. Katz, S. J.; Conway, C.C.; Hammen, C. L.; Brennan, P. A. Childhood social withdrawal, interpersonal impairment, and young adult depression: A mediational model. *J Abnorm Child Psychol*. **2011**, 39, 122-1238. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=O56925378> (accessed on 10 December 2019).
 15. Kim, K. E. Analysis of Longitudinal Relation of Children's Social Withdrawal and Peer Alienation. *Journal of the Korea Academia-Industrial Cooperation Society*. **2017**, 18, 391-399. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=A103253081> (accessed on 10 December 2019).
 16. Rubin, K. H.; Bukowski, W.; Parker, J. *Peer interactions, relationships, and groups*. In Eisenberg, N. (Ed), *Handbook of Child Psychology (6th ed): Social, emotional, and personality development*; Wiley: New York, NY, 2006; pp. 571-645.
 17. Gifford-Smith, M. E.; Brownell, C. A. Childhood peer relationships: social acceptance, friendships, and peer networks. *Journal of School Psychology*. **2003**, 41, 235-284. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=O34420558> (accessed on 10 December 2019).
 18. Park, B. S.; Bae, S. W.; Park, K. J.; Seo, M. K.; Kim, H. J. A structural analysis of the relationship between peer attachment, social withdrawal, depression, and school adjustment. *Health and Social Welfare Review*. **2017**, 37, 72-101. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=A103353061> (accessed on 10 December 2019).

19. Lee, B. J.; Min, W. H.; Kim, J. E. A study for developmental trajectories of social withdrawal in adolescence: An exploratory approach based on developmental-contextualism perspective. *Korean Journal of Youth Studies*. **2014**, 21, 317-346. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=A102950766> (accessed on 10 December 2019).
20. Hymel, S.; Rubin, K. H.; Rowden, L.; LeMare, L. Children's peer relationships: Longitudinal prediction of internalizing and externalizing problems from middle to late childhood. *Child Development*. **1990**, 61, 2004-2021. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=O68385816> (accessed on 10 December 2019).
21. Rubin, K. H.; Chen, X.; McDougall, P.; Bowker, A.; McKinnon, J. The Waterloo Longitudinal Project: predicting adolescent internalizing and externalizing problems from early and mid-childhood. *Developmental Psychopathology*. **1995**, 7, 751-764. Available online: <https://doi.org/10.1017/S0954579400006829> (accessed on 10 December 2019).
22. Gazelle, H.; Rudolph, K. D. Moving toward and away from the world: social approach and avoidance trajectories in anxious solitary youth. *Child Development*. **2004**, 75, 829-849. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=O35988670> (accessed on 10 December 2019).
23. Oh, W.; Rubin, K. H.; Bowker, J. C.; Booth-LaForce, C.; Rose-Krasnor, L.; Laursen, B. Trajectories of social withdrawal middle childhood to early adolescence. *J Abnorm Child Psychol*. **2008**, 36, 553-566. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=O48922399> (accessed on 10 December 2019).
24. Cho, Y. J.; Ju, H. W.; Hyun, M. H. The mediating effect of social withdrawal on the relationship between negative parenting attitudes and victimization in adolescents, *Studies on Korean Youth*. **2015**, 26, 59-81. Available online: <http://www.riss.kr.proxy.nsu.ac.kr:8010/link?id=A100520595> (accessed on 10 December 2019).
25. Zeller M.H.; Reiter-Purtill, J.; Ramey, C. Negative peer perceptions of obese children in the classroom environment. *Obesity*. **2008**, 16, 755-762.
26. Griffiths, L. J.; Parsons, T. J.; Hill, A. J. Self-esteem and Quality of Life in Obese Children and Adolescents: A Systematic Review. *International Journal of Pediatric Obesity*. **2010**, 5, 282-304. Available online: <https://doi.org/10.3109/17477160903473697> (accessed on 10 December 2019).
27. National Youth Policy Institute. The user's guide for 1st-7th research data of Korean Children and Youth Panel Survey. National Youth Policy Institute: Sejong, Korea, 2017.
28. Kim, S. H.; Kim, K.Y. Development of Behavior Problem Scale for Children and Adolescence, *Journal of Korean Home Management Association*. **1998**, 16, 155-166.
29. Min, B. S. The effects of school life adjustment and the ego concept on academic performance. Unpublished master's thesis, Hongik University, Seoul. 1991.
30. Bandalos, D. L.; Finney, S. J. Item parceling issues in structural equation modeling. In *New developments and techniques in structural equation modeling*, 1st ed.; Marcoulides, G.E., Schumacker, R.E.; Psychology Press, New York, NY, 2001; pp. 289-316.
31. Hong, S.H.; Park, M.S.; Kim, W.J. Testing the autoregressive cross-lagged effects between adolescents' internet addiction and communication with parents: multigroup analysis across gender. *Korean J Educ Psychol*. **2007**, 21, 129-143.
32. Schlueter, E.; Davidov, E.; Schmidt, P. Applying autoregressive cross-lagged and latent growth curve models to a three-wave panel study. In *Longitudinal models in the behavioral and related sciences*,; Montfort, K., Oud, J., Satorra, A., eds.; Lawrence Erlbaum Associates, Inc., Mahwah, NJ, 2007; pp. 315-336.

33. Kline, R.B. Principles and practice of structural equation modeling. 3rd ed.; Guilford Press, New York, NY, 2010; p. 63.
34. Cole, D. A.; Maxwell, S. E. Testing mediational models with longitudinal data: questions and tips in the use of structural equation modeling. *J Abnorm Psychol.* **2003**, 112, 558.
35. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J Mark Res.* **1981**, 18, 39–50.
36. Williams, N. A.; Fournier, J.; Coday, M.; Richey, P. A.; Tylavsky, F. A.; Hare, M. E. Body esteem, peer difficulties and perceptions of physical health in overweight and obese urban children aged 5 to 7 years. *Child Care Health Dev.* **2013**, 39, 825-834.
37. Faith, M. S.; Leone, M. A.; Ayers, T. S.; Heo, M.; Pietrobelli, A. Weight criticism during physical activity, coping skills, and reported physical activity in children. *Pediatrics.* **2002**, 110, e23-e23.
38. Epstein, L.H.; Klein, K.R.; Wisniewski, L. Child and parent factors that influence psychological problems in obese children. *Int J Eat Disord.* **1994**, 15, 151–158.
39. Puder, J. J.; Munsch, S. (2010). Psychological correlates of childhood obesity. *International Journal of Obesity.* **2010**, 34, S37–S43.
40. Poulin, F.; Chan, A. Friendship stability and change in childhood and adolescence. *Developmental review.* **2010**, 30, 257-272.
41. Aboud, F.E.; Mendelson, M.J. Determinants of friendship selection and quality: developmental perspectives. In *The Company They Keep: Friendship in Childhood and Adolescence*,; Bukowski, W.M., Newcomb, A.F., eds.; Cambridge University Press: New York, NY, 1998; pp. 87–112.
42. Mesurado, B.; De Minzi, M.C.R. Child's Personality and Perception of Parental Relationship as Correlates of Optimal Experience. *Journal of Happiness Studies.* **2013**, 14, 199-214. Available online: <https://doi.org/10.1007/s10902-012-9324-8> (accessed on 10 December 2019).
43. Mishra, S., Mallick, P. K., Jena, L., & Chae, G. S. (2020). Optimization of Skewed Data Using Sampling-Based Preprocessing Approach. *Frontiers in Public Health*, 8.
44. Bhoi, A. K., Mallick, P. K., Liu, C. M., & Balas, V. E (Eds.) (2021). *Bio-inspired Neurocomputing*, Springer
45. Mallick, P. K., Balas, V. E., Bhoi, A. K., & Zobia, A. F. (Eds.). (2018). *Cognitive Informatics and Soft Computing: Proceeding of CISC 2017 (Vol. 768)*. Springer.