

Relation of Temperament and Problem Behaviors in Adolescents: A Mediating Effect of Dysfunctional Anger Expressions

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청소년 기질과 문제행동간의 관계분석: 역기능적 분노표현의 매개효과

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Abstract Among many other factors associated with anger expressions and problem behaviors, the effect of temperament has not been much investigated in adolescents. Thus, the purpose of this study was to investigate the relationship between temperament and problem behaviors in adolescents, and whether dysfunctional anger expressions mediated this relation. A total of 360 students in either middle or high school participated but only data from 354 surveys were analyzed. We found that temperament was associated with dysfunctional anger expressions and problem behaviors, and the relationship between temperament and problem behaviors was mediated by dysfunctional anger expressions. Temperament adaptability was shown to be negatively related with dysfunctional anger expressions and problem behaviors, while temperament approach was shown to be positively related with anger-out expression and externalized problem behaviors. This study suggests that appropriate intervention of anger related issues in adolescents considering their temperament should be needed.

Key Words : Temperament, Dysfunctional Anger Expressions, Problem behaviors, Adolescents, Mediator

요약 분노표현 및 문제행동에 영향을 미치는 많은 요인들 중, 청소년의 기질이 어떤 영향을 미치는지에 대한 연구는 비교적 적은 편이다. 따라서, 본 연구는 청소년의 기질과 문제행동 간의 관계를 연구하고, 역기능적 분노표현이 이러한 관계를 매개하는지 알아보려고 하였다. 360명의 중,고등학생이 연구에 참여하였지만, 354개의 설문 조사 데이터가 분석되었다. 연구결과 기질은 역기능적 분노표현과 문제행동과 관련이 있으며 기질과 문제행동간의 관계는 역기능적 분노표현에 의해 매개된다는 것으로 나타났다. 기질 적응성은 역기능적 분노표현 및 문제행동과 부적적으로 관련이 있는 것으로 나타났고, 기질 접근은 분노표현과 외현적 문제행동과 정적으로 관련이 있는 것으로 나타났다. 본 연구는 청소년의 기질을 고려해서 분노 관련 문제에 대한 적절한 개입이 필요함을 시사한다.

주제어 : 기질, 역기능적 분노표현, 문제행동, 청소년, 매개변수

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1. Introduction

Anger is the universal emotion that humans experience in daily life and natural response to various events engaged with the relationships in society[1]. The positive role of anger is to defend ourselves from outward physical or psychological distress[2] and thus, we are able to cope with those threatening situation through attempts to negotiate and choose strategies to solve the problems[3]. The expression of anger is determined not by the stimulus of the external environment itself, but by how the physiological, cognitive, and behavioral factors of person who feels anger interpret and respond to that anger[4]. In other words, physiological arousal is generated by the external stimulus that causes anger, but it is classified into adaptive or maladaptive behavior depending on the result of whether to perceive anger negatively or to express behaviorally negative cognition. If cognitive distortions due to irrational thoughts in the process of making such decisions is accompanied by aggressive behavior, it becomes a factor that causes problems of oneself and others as well as social problems[2]. In particular, anger can be a risk factor causing a variety of problems if the negative emotional state is not controlled internally and continues to increase. According to Spielberger, Reheiser and Sydeman, Anger can be represented by verbal or behavioral expression of physiological arousal or feelings, which is called anger-out expression[5]. Anger can also be hidden or suppressed, resulting in the avoidance of expressions of anger, which is called anger-in expression. Both anger-out and anger-in expressions are classified as dysfunctional expressions of anger because those expressions function in an abnormal way and can elicit negative outcomes[6].

Adolescents experience rapid physical and social changes. It is possible that adolescents' anger is stimulated by emotional imbalance and

stress due to physical changes or restricted individuality and freedom due to sociocultural control and repression[7]. In the case of adolescents who have not learned how to express and cope with anger, they recognize that their coping is ineffective in anger situations, resulting in social problems such as frustration, depression, and dependence[8]. Adolescent problem behaviors is also one of emotional expression and it is a problem of emotional regulation, which can be seen as a result of the individual's failure to control negative emotions including anger[9]. In general, problem behaviors of adolescents are classified into internalized problems such as anxiety, social atrophy, and depression, and externalized problems such as overactivity and delinquency[10]. It has been shown that dysfunctional anger expressions, anger-in and anger-out expressions can cause problem behaviors of adolescents[11]. Kim and Lee found that anger-in expression was associated with internalized problem behaviors and anger-out expression was associated with both internalized and externalized problem behaviors among high school students[12]. Adolescents with anger-in and anger-out expression also have shown to be at risk of psychological maladjustment such as depression, anxiety, and social atrophy as well as misconduct and aggression[13].

The factors related to adolescents' dysfunctional anger expressions and problem behaviors include personal, family, and social ones. The personal factors include self-control, personality, narcissism, irrational beliefs, interpersonal tendency, anger level, cognitive characteristics, and so on[14-20]. The family factors include parenting style, conflict between parents, etc. [21,22] and the social factors include contact with delinquent friends and maladaptation to school[23]. Since personality is not only an innate heritable disposition but interacts with environmental influences, there is

a strong association between personality and anger expressions. Temperament plays an important role in constructing adolescent personality. A longitudinal study showed that temperamental or personality differences in children's emotionality and regulation actually led to differences in their social capability and adaptation later in life[24].

Conlinger classified temperament as dimensions of personality into novelty seeking, harm avoidance, and reward dependence in terms of basic stimulus-response characteristics[25]. Aslan and Arkar found that anger-in expression was positively correlated with harm avoidance but negatively correlated with reward dependence. Anger-out expression, however, was shown to be positively correlated with novelty seeking but negatively correlated with reward dependence[26]. Giancola, Mezzich and Tarter found that difficult temperament, a possible cause of difficulty in being handled and conflicts in relationships between siblings or others due to high activity and negative dimensions, was related to externalized and aggressive behaviors in adolescents[25]. Windle also investigated the relationship between temperament, social support, and problem behaviors with adolescents[28]. It was shown that a difficult temperament had an effect on depressive symptoms and delinquent activity directly as well as indirectly mediated by reduced social support. Ortiz and Gándara, however, found that temperament difficulties were related to anger but not with aggression [29]. They found that the more the difficult temperament, the greater the externalized state anger.

Compared to other factors associated with anger expression and problem behaviors, the influence of temperament has not been much investigated in adolescents. Since temperament is innate and also largely affected by early childhood environment, the relationship between temperament and behavioral problems has been examined for young children or early age

adolescents[30–32]. Although temperament is established in early age, behavioral problems in adolescents, such as psychological problems, aggressive behaviors, drug abuse, suicidal attempts, and so on increase and cause not only individual but social problems. Thus, it is important to examine how temperament has an effect on behavioral problems in adolescents. Furthermore, the relationship between temperament and dysfunctional anger expressions[26] and the relationship between temperament and aggressive behaviors[25] has been shown in adolescents, but how these variables are related has not been investigated. The effect of temperament on problem behaviors was also shown to be mixed. Therefore, the purpose of this study was to investigate the relationship between temperament, anger expressions, and problem behaviors in adolescents and to specify temperament characteristics that can predict such behaviors.

2. Method

2.1 The study model

The purpose of the study was to analyze the following as shown in Figure 1. First, we investigated whether temperaments related to anger expressions (anger-in and anger-out). Second, we investigated whether anger expressions related to internalized and externalized problem behaviors. Lastly, whether anger expressions mediated the relationships between temperament and problem behaviors. To test the multiple mediation effect, we performed General Linear Model (GLM) mediation model by using Medmode module of Jamovi 1.2.27 program. Since the GLM mediation model in Medmod module of Jamovi takes a path estimates approach rather than stepwise regression analysis, it is possible to estimate the standard error and to solve the problem violating

normal distribution and thus, it is evaluated as a more powerful tool improving the accuracy of estimation[33].

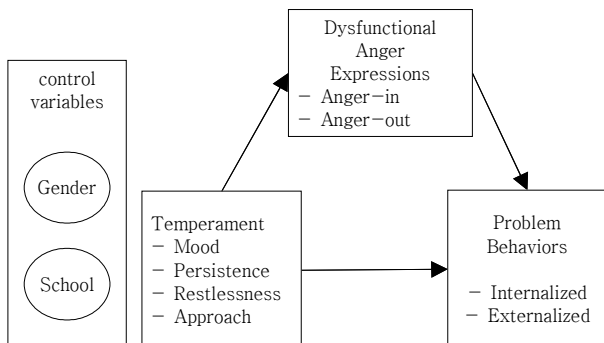


Fig. 1. The study model

2.2 Participants

Participants were 360 adolescents enrolled in either a middle school or a high school located in Cheongju in Chungbuk province. Three classes from each school, a total of 12 classes was selected. The study was conducted from the 4th till the 15th of June 2018 and approved by the IRB of Dankook University(DKU 2018-05-005). Among 360 distributed copies, 354 ones were collected and excluded 20 surveys including improper responses and thus, a total of 334 surveys was analyzed for the study. Male adolescents were 172 (51.5%) and female adolescents were 162 (48.5%). In the middle school, there were 50 first year students (15.0%), 63 second year students (18.9%), and 51 third year students (15.3%). In the high school, there were 55 first year students (16.5%), 53 second year students (15.9%), and 59 third year students (17.7%).

2.3 Measurements

2.3.1 Revised Dimensions of Temperament Survey (DOTS-R)

To measure temperament of adolescents, we used Revised Dimensions of Temperament Survey (DOTS-R). Windle and Lehner revised a dimensions of temperament survey developed

and used for the first time in a longitudinal study in New York, the United States[34]. This consists of 54 items in ten dimensions that measure the temperament of children and adolescents. Lee adapted this scale by excluding four dimensions – active level during sleep, sleep rhythmicity, eating rhythmicity and daily habits rhythmicity that is judged to be unrelated to adolescents' interactions[35]. In this study, we used Korean version of Lee consisting of 34 items in six dimensions of temperament, general activity level, approach-withdrawal, flexibility-rigidity, positive mood, distractibility and persistence. Participants had to respond each item from 1(usually false) to 4(usually true).

To see whether these six characteristics of temperament still apply to Korean adolescents, we performed exploratory factor analysis in this study. This analysis was carried out using the maximum likelihood extraction method in combination with a oblimin rotation. Since the measure of sampling adequacy(MSA) was 0.849 and Barlett's test of sphericity was significant ($\chi^2(df=561)=4442, p<.001$), data of this study was adequate for factor analysis. All the items loaded higher than 0.4 were on the corresponding factor and items lower than 0.4 were in the other factors. As results, four factors whose eigenvalues were greater than 1 were extracted. The different temperament aspects of adolescents were grouped in four factors: (F1) mood ("s/he laughs and has fun with many things"), (F2) persistence ("s/he persists with a task until she has finished") including distractibility ("when s/he is absorbed in a task s/he is never distracted"), (F3) adaptability combining flexibility-rigidity ("s/he takes a long time to get used to new things") with general activity level ("s/he can't keep still"), (F4) approach-withdrawal ("s/he approaches new things that are shown to him/her"). Several items related to actual movements in the dimension of general activity level ("s/he moves a lot") were excluded in this analysis. Items of adaptability(F3)

were transposed to make the direction of adaptability align with other temperaments. Thus, less adaptability indicated person is restless and unable to adapt to new things. The eigenvalues and the percentage of explained variance in every factor were as follows: F1(6.29;12.8), F2(3.21;9.87), F3(2.41;8), F4(1.1;7.51).

Reliability of the factors found in this study was 0.9 for the mood factor(7 items), 0.81 for the persistence factor(7 items), 0.75 for the adaptability factor(9 items) and 0.77 for the approach factor(5 items). Overall reliability of 28 items of the scale was Cronbach's α coefficient of 0.81.

2.3.2 The adolescent's STAXI-K

To measure anger expressions of adolescents, we used Korean version of State-trait Anger Expression Inventory(STAXI-K) that Lee and Cho modified STAXI originally developed by Spieberger[36,37]. Although STAXI-K contains 44 items in two dimensions, state-trait anger and anger expressions, we only used anger-in and anger-out (eight items each) of anger expressions for the purpose of the study. Thus, the scale contains 16-items with response ranging from 1(never) to 4(always). Anger-in represents suppressing anger("I keep things in"), whereas anger-out represents expressing anger toward other people or objects("I lose my temper"). Overall reliability of the scale was Cronbach's α coefficient of 0.76(anger-in=0.7, anger-out=0.73).

2.3.3 Korea-Youth Self Report (K-YSR)

To measure problem behaviors of adolescents, we adopted Korea-Youth Self Report (K-YSR) modified by Kim[38]. Achenbach originally developed assessment to measure behavioral and emotional problems of children and adolescents[39]. Park selected items related to externalized and internalized behaviors and translated in Korean[40]. Then Kim excluded

items of somatic complaints and used 5-point Likert scale instead of 3-point Likert scale[38]. Internalized problem behavior consists of 22 items of social withdrawal("I like to be alone") and anxiety/depression("I feel that no one loves me") and externalized problem behavior consists of 30 items of delinquent behavior("I lie or deceive others") and aggressive behavior("I fight often"). Participants had to respond each item from 1(strongly disagree) to 5(strongly agree). Overall reliability of 52 items of the scale was Cronbach's α coefficient of 0.94(internalized behavior=0.92, externalized behavior=0.9).

2.3.4 Demographic information

To gather specific characteristics of sample, the questionnaire included questions regarding participants' gender, school, academic level and household income. Since it has been found that adolescents' anger expression and aggressive behaviors are differed by gender and age[41,42], gender and school variables were controlled for analysis.

2.3.5 Statistical analysis

We used Jamovi 1.2.27 for statistical analysis in this study. We performed descriptive analysis and Pearson's correlation analyses before testing the study model. To assess which independent variables would be a significant predictor of dependent variable, we performed a hierarchical multiple regression. Lastly, to test multiple mediation effect of the study model, we performed the GLM mediation model in Medmod module of Jamovi.

3. Results

3.1 Descriptive Analysis

A total of 334 adolescents was analyzed for the study and the results of descriptive analysis are

presented in Table 1. There were 172(51.5%) male and 162(48.5%) female participants with an average age of 15.1(SD=1.8). Among a total of 166(49.7%) middle school students, there were 86(51.8%) males and 80(48.2%) females. Among 168(50.3%) high school students, there were 86(51.2%) males and 82(48.8%) females. The average of each temperament was 3.17, 2.4, 2.97, and 2.67 for mood, persistence, adaptability, and approach, respectively. The average of anger-in was 16 out of total score of 32 and the average of anger-out was 14.1. The average of internalized problem behavior was 50.6 out of total score of 110 and the average of externalized problem behavior was 57 out of total score of 150.

Table 1. Descriptive findings of variables

Variables	Sub scales	Frequency	Mean(SD)
Gender	Male	172(51.5%)	
	Female	162(48.5%)	
Age			15.1(1.8)
School	Middle	166(49.7%)	
	High	168(50.3%)	
Academic level	High	68(20.6%)	
	Middle	183(55.5%)	
	Low	79(23.9%)	
household income level	1(high)	13(3.9%)	
	2	81(24.3%)	
	3	211(63.4%)	
	4	24(7.2%)	
	5(low)	4(1.2%)	
Temperament	Mood		3.17(.63)
	Persistence		2.4(.49)
	Adaptability		2.97(.47)
	Approach		2.67(.54)
Anger expression	Anger-in		16(4.21)
	Anger-out		14.1(3.88)
Problem behavior	Internalized		50.6(16)
	Externalized		57(14.4)

3.2 Bivariate Analyses

For bivariate analyses, gender(male=0, female=1) and school(middle school=0, high school=1) were transformed to Dummy variable.

Although school was not shown a significant correlation with any variable, gender was significantly correlated with problem behaviors. Female students showed more problem behaviors both internally($r=.3, p<.001$) and externally($r=.14, p=.012$). Pearson's correlation coefficient on research variables is shown in Table 2. Among temperaments, mood was significantly correlated with adaptability($r=.18, p=.001$) and approach($r=.52, p<.001$). Participants with a higher level of positive affect showed were shown to tend to approach toward new persons/things and to adapt more. Anger-in expression was negatively correlated with temperament mood($r=-.19, p<.001$), adaptability ($r=-.34, p<.001$) and approach($r=-.13, p=.019$) but positively correlated with temperament persistence($r=.13, p=.021$). Anger-out expression was negatively correlated with temperament adaptability($r=-.24, p<.001$) but positively correlated with approach($r=.21, p<.001$). Internalized problem behavior was negatively correlated with temperament mood($r=-.46, p<.001$), adaptability($r=-.3, p<.001$) and approach($r=-.22, p<.001$). Externalized problem behavior was negatively correlated with temperament mood($r=-.12, p=.027$) adaptability($r=-.32, p<.001$). Anger-in expression was significantly correlated with both internalized($r=.47, p<.001$) and

Table 2. Pearson's correlation coefficient on research variables

	T_M	T_P	T_Ad	T_Ap	anger in	anger out	prob in	prob ex
T_M	1	.02	.18**	.52***	-.19**	.09	-.46**	-.12*
T_P		1	.01	-.08	.13*	.04	.03	-.04
T_Ad			1	.07	-.34***	-.24***	-.3***	-.32***
T_Ap				1	-.13*	.21***	-.22**	.09
anger in					1	.31***	.47***	.31***
anger out						1	.11	.42***
prob in							1	.58***
prob ex								1

*p<.05, **p<.01, ***p<.001

T_M= temperament mood, T_P= temperament persistence, T_Ad= temperament adaptability, T_Ap= temperament approach, prob in= internalized problem, prob ex= externalized problem

externalized($r=.31, p<.001$) problem behavior, whereas anger-out expression was significantly correlated with only externalized problem behavior($r=.4, p<.001$).

3.3 Analyses for the study model

3.3.1 Predicting anger expressions

To test whether the independent variables of temperament would predict anger-in and anger-out, respectively, hierarchical multiple regression was used while controlling for gender and school. First, the results of predicting anger-in expression are shown in Table 3. Two demographic variables, gender and school explained only 0.6% of the variance in anger-in($F=.99, p=.37$). The model after entering temperaments explained an additional 15.5% of the variance($F=9.74, p<.001$). Among temperaments, persistence($\beta=.14, p=.007$) and adaptability($\beta=-.32, p<.001$) remained a strong predictor of anger-in expression. Thus, participants who tend to be persistent more and adapt less showed more anger-in expression.

Table 3. Predicting anger-in

Model	Variables	<i>B</i>	β	<i>F</i>	<i>p</i>	<i>R</i> ²	ΔR^2
				.985	.37	.006	
1	Gender	.64	.15				
	School	.21	.05				
				9.74	<.001	.16	.155
	Mood	-.73	-.11				
2	Persistence	1.24	.14**				
	Adaptability	-2.9	-.32***				
	Approach	-.33	-.04				

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

Second, the results of predicting anger-out expression are shown in Table 4. Two demographic variables, gender and school explained only 1% of the variance in anger-out($F=1.89, p=.15$). The model after entering temperaments explained an additional 10.4% of the variance($F=6.72, p<.001$). Among

temperaments, adaptability($\beta=.23, p<.001$) and approach($\beta=-.24, p<.001$) and remained a strong predictor of anger-out expression. Thus, participants who tend to adapt less and approach more toward new persons/things showed more anger-out expression.

Table 4. Predicting anger-out

Model	Variables	<i>B</i>	β	<i>F</i>	<i>p</i>	<i>R</i> ²	ΔR^2
				1.89	.15	.01	
1	Gender	-.79	-.2				
	School	-.31	-.08				
				6.72	<.001	.12	.104
	Mood	.08	.01				
2	Persistence	.35	.04				
	Adaptability	-2.0	-.24***				
	Approach	1.62	.23***				

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

3.3.2 Predicting problem behaviors

To test whether the independent variables of anger expressions would predict internalized and externalized problem behavior, respectively, hierarchical multiple regression was used while controlling for gender and school. First, the results of predicting internalized problem behavior are shown in Table 5. Two demographic variables, gender and school explained 9% of the variance in internalized problem behavior($F=15.4, p<.001$). Female students showed internalized problem behavior more than male students($\beta=.59, p<.001$). The model after entering anger expressions explained an additional 21.7% of the variance($F=30.58,$

Table 5. Predicting internalized problem behavior

Model	Variables	<i>B</i>	β	<i>F</i>	<i>p</i>	<i>R</i> ²	ΔR^2
				15.4	<.001	.09	
1	Gender	9.43	.59***				
	School	-2.7	-.17				
				30.58	<.001	.31	.217
2	Anger-in	1.8	.48***				
	Anger-out	-.18	-.04				

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

$p < .001$). Anger-in expression significantly predicted internalized problem behavior ($\beta = .48, p < .001$), whereas anger-out expression did not predict. Thus, participants who expressed more anger-in expression showed more internalized problem behaviors.

Second, the results of predicting externalized problem behavior are shown in Table 6. Two demographic variables, gender and school explained 4% of the variance in externalized problem behavior ($F = 6.71, p = .001$). Female students showed externalized problem behavior more than male students ($\beta = .35, p = .002$) and middle school students showed externalized problem behavior more than high school students ($\beta = -.24, p = .034$). The model after entering anger expressions explained an additional 20.1% of the variance ($F = 23.84, p < .001$). Both Anger-in expression ($\beta = .19, p < .001$) and anger-out expression ($\beta = .35, p < .001$) significantly predicted externalized problem behavior. Thus, participants who expressed more anger-in as well as anger-out expression showed more externalized problem behaviors.

Table 6. Predicting externalized problem behavior

Model	Variables	<i>B</i>	β	<i>F</i>	<i>p</i>	<i>R</i> ²	ΔR ²
1				6.71	.001	.04	
	Gender	4.88	.35**				
	School	-3.38	-.24*				
				23.84	<.001	.24	.201
2	Anger-in	.64	.19***				
	Anger-out	1.29	.35***				

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

3.3.3 Testing a mediating effect of anger expressions

To determine whether the association between temperaments and problem behaviors would be mediated by anger expressions, a multiple mediation analysis was performed for each dependent variable (internalized and externalized problem behavior), respectively. First, the results of a mediating effect on internalized problem

behavior are shown in Table 7. Total effect of temperament adaptability on internalized problem behavior was statistically significant ($Z = -2.96, p < .001$). Since indirect effect ($Z = -4.5, p < .001$) as well as direct effect ($Z = -2.96, p = .003$) was statistically significant, anger-in expression showed a partial mediation in the relationship between temperament adaptability and internalized problem behavior. Total effect of temperament mood on internalized problem behavior was also statistically significant ($Z = -7.31, p < .001$) but only direct effect was statistically significant ($Z = -7.18, p < .001$). Although there was significant indirect effect of anger-in between temperament persistence and internalized problem behavior ($Z_{indirect} = 2.3, p = .022$), the total effect was not significant and thus, there was no mediating effect in the relationship between persistence and internalized problem behavior. Hence, adolescents with higher positive affect and those who adapt more showed less internalized problem behavior. Additionally,

Table 7. Mediating effect (DV: internalized problem behaviors)

Type	Effect	<i>B</i>	<i>S.E.</i>	β	<i>Z</i>
Indirect effect	M → A_in → P_in	-1.04	.59	-.04	-1.75
	M → A_out → P_in	.002	.02	6.87e-5	.1
	P → A_in → P_in	1.6	.65	.05	2.49*
	P → A_out → P_in	.005	.04	1.47e-4	.11
	Ad → A_in → P_in	-3.65	.8	-.11	-4.5***
	Ad → A_out → P_in	-.04	.37	-.001	-.11
	Ap → A_in → P_in	-.22	.66	-.008	-.34
	Ap → A_out → P_in	.03	.3	.001	.11
Direct effect	M → P_in	-9.3	1.3	-.37	-7.18***
	P → P_in	.38	1.39	.01	.27
	Ad → P_in	-4.64	1.57	-.14	-2.96**
	Ap → P_in	1.04	1.51	.04	.69
Total effect	M → P_in	-10.3	1.41	-.42	-7.31***
	P → P_in	2.0	1.51	.06	1.33
	Ad → P_in	-8.34	1.59	-.25	-5.25***
	Ap → P_in	.85	1.62	.03	.53

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

M = temperament mood, P = temperament persistence, Ad = temperament adaptability, Ap = temperament approach, A_in = anger-in, A_out = anger-out, P_in = internalized problem

adolescents who adapt more showed less anger-in expression, resulting in less internalized problem behavior.

Second, the results of a mediating effect on externalized problem behavior are shown in Table 8. Total effect of temperament adaptability on externalized problem behavior was statistically significant ($Z = -5.86, p < .001$). Since indirect effect ($Z_{\text{anger-in}} = -2.42, p = .016, Z_{\text{anger-out}} = -3.75, p < .001$) as well as direct effect ($Z = -3.47, p < .001$) was statistically significant, anger-in and anger-out expression showed a partial mediation in the relationship between temperament adaptability and externalized problem behavior. Total effect of temperament approach on externalized problem behavior was also statistically significant ($Z = 3.06, p = .002$). Since indirect effect ($Z = 2.98, p = .003$) as well as direct effect ($Z = 2.15, p = .032$) was statistically significant, anger-out expression showed a partial mediation in the relationship between temperament approach and externalized problem behavior.

Table 8. Mediating effect (DV: externalized problem behaviors)

Type	Effect	<i>B</i>	<i>S.E.</i>	β	<i>Z</i>
Indirect effect	M → A _{in} → P _{ex}	-.37	.25	-.02	-1.5
	M → A _{out} → P _{ex}	.07	.46	.003	.15
	P → A _{in} → P _{ex}	.6	.32	.02	1.9
	P → A _{out} → P _{ex}	.33	.5	.01	.66
	Ad → A _{in} → P _{ex}	-1.35	.56	-.05	-2.42*
	Ad → A _{out} → P _{ex}	-2.52	.67	-.08	-3.75***
	Ap → A _{in} → P _{ex}	-.09	.24	-.003	-.36
	Ap → A _{out} → P _{ex}	1.79	.6	.07	2.98**
Direct effect	M → P _{ex}	-2.97	1.32	-.14	-2.25*
	P → P _{ex}	-1.42	1.44	-.05	-.98
	Ad → P _{ex}	-5.69	1.64	-.19	-3.47***
	Ap → P _{ex}	3.28	1.53	.13	2.15*
Total effect	M → P _{ex}	-3.27	1.43	-.15	-2.3*
	P → P _{ex}	-.49	1.55	-.02	-.32
	Ad → P _{ex}	-9.56	1.63	-.32	-5.86***
	Ap → P _{ex}	4.98	1.63	.2	3.06**

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

M= temperament mood, P= temperament persistence, Ad= temperament adaptability, Ap= temperament approach, A_{in}=anger-in, A_{out}=anger-out, P_{ex}=externalized problem

Lastly, total effect of temperament mood on externalized problem behavior was statistically significant ($Z = -2.3, p = .022$) but only direct effect was statistically significant ($Z = -2.25, p = .024$).

Similar to the results of internalized problem behavior, adolescents with higher positive affect and those who adapt more showed less externalized problem behavior. Adolescents who approach to new things/persons more, however, showed more externalized problem behavior. Additionally, adolescents with higher adaptability expressed less anger-in as well as less anger-out expression, resulting in less externalized problem behavior. In contrast, adolescents who approach to new things/persons more showed more anger-out expression, resulting in more externalized problem behavior.

4. Discussion and Conclusion

In this study, we investigated how temperament, anger expressions and problem behaviors in adolescents were related and which dimension of temperament can predict such anger expression and problem behaviors in adolescents. We found the relationship between temperament and anger expressions as well as that between anger expressions and problem behaviors. Anger-in expression was shown to be positively related with temperament persistence and negatively related with temperament adaptability. Meanwhile, anger-out expression was shown to be negatively related with temperament adaptability and positively related with temperament approach. That is, adolescents who tend to adapt less showed more anger-in as well as anger-out expression. Adolescents who tend to be more persistent showed more anger-in expression, while those who tend to approach more toward new persons or things showed more anger-out expression. These results were similar to the relationship between

stimulus-response characteristics and anger expressions in that harm avoidance was positively related to anger-in expression and novelty seeking was positively related to anger-out expression[26]. As harm avoidance indicates passive-avoidant behaviors, while novelty seeking indicates exploratory activities, these two dimensions are differentiated to different anger expressions.

Furthermore, anger-out expression was shown to be associated with externalized problem behaviors in adolescents, while anger-in expression was shown to be associated with both internalized and externalized problem behaviors. The finding that anger-in expression was related to both problem behaviors seems contradictory to the previous finding of Kim and Lee in that anger-out expression was related with both problem behaviors[12]. It has been shown, however, that there are many factors such as personal, family-related, school-related, and community-related factors that influence on adolescents' problem behaviors. It was found that all personal, family-related, and school-related factors generally had an impact on the internalized problem behaviors of depression, anxiety, and so on, while school adaptation strongly predicted externalized problem behaviors[43]. Thus, it is possible anger-in expression leads to school maladaptation, while leads to more externalized problem behaviors in adolescents.

More importantly, we found a mediation effect of anger expressions in the relationship between adolescents' temperament and problem behaviors. The relationship between temperament adaptability and internalized problem behavior was mediated by anger-in expression. Namely, adolescents who adapt less showed more anger-in expression, and thus more internalized problem behaviors. In a similar vein, the relationship between temperament approach and externalized problem behavior was mediated

by anger-out expression. Namely, adolescents who approach new things or persons more showed more anger-out expression, leading to more externalized problem behavior. The influence of temperament adaptability on externalized problem behaviors was mediated by dysfunctional anger expressions. Similar to the influence on internalized problem behavior, adolescents who adapt less showed more anger-in and anger-out expressions, resulting in more externalized problem behaviors. This result implies that maladaptation might be a strong factor on problem behaviors in adolescents. Since less adaptability indicates restlessness and maladaptation, it is consistent with the previous finding that difficult temperament led to problem behaviors in adolescents[25]. Furthermore, the finding that temperament approach had a positive effect on anger-out expression, resulting in externalized problem behaviors, is consistent with the previous results in which participants who tend not to withdraw were found to be more impulsive and exhibit less self-control with more externalized problem behaviors[44]. Thus, one possibility of the relationship between impulsivity and externalized problem behaviors such as delinquency[45] can be the mediation factor of anger-out expression in adolescents.

There are some limitations in this study. Although the relationship between temperament and problem behaviors was shown in adolescents, temperament is a complex characteristic and may possibly interacted with other factors and thus, it is necessary to study temperament more thoroughly than investigating discrete dimensions of temperament in future. Second, since dysfunctional anger expression was used for a mediation effect in this study, functional anger expression, such as anger control and regulation, should be further investigated. Third, further longitudinal study would be needed to clarify a causal effect due to the limitation of cross-sectional study. Lastly,

there was a limitation of samples. Since adolescents from only one middle school and one high school in specific province of Korea were sampled, more adolescents in various areas should be sampled for generalization of findings.

In conclusion, the relationship between temperament and problem behaviors in adolescents was shown to be mediated by dysfunctional anger expressions. Adolescents who tend to adapt less and are more restless showed more dysfunctional anger expressions and thus, both internalized and externalized problem behaviors were shown. Meanwhile, the temperament approach was associated with anger-out expression and externalized problem behaviors because temperament approach with high levels can correspond to impulsivity and high activity. This study, therefore, implies that appropriate intervention of anger related issues in adolescents considering their temperament is needed.

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