The moderating role of emotional engagement on the relation of anger regulation with later achievement in elementary school

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Abstract
The objective of this study was to understand if and for whom anger regulation relates

achievement. Discussion centers on anger regulation, moderation, and implications of anger regulation for school psychologists.

Keywords
anger regulation, emotional engagement, achievement, elementary school

Emotion regulation influences a range of outcomes including academic functioning, behavior management, and successful peer and adult relationships (e.g., Cole et al., 1996; Skibbe et al., 2019). Emotion theorists have argued that emotion regulation is best assessed through an emotion-specific lens, meaning that anger regulation should be conceptualized as a process distinct from the regulation of other emotions (Izard, 1977; Tomkins, 1963). Anger is a particularly important emotion to assess, given its unique positive and negative outcomes, as well as challenges associated with its regulation. Anger can be a difficult "extrapunitive" emotion to socialize and regulate (Zahn-Waxler et al., 1998). Anger is also a discrete and complex emotion that can be

emotion regulation as psychological processes related to emotions and changes to emo-

adaptations (e.g., STAXI2-C/A; del Barrio et al., 2004). Trait-based approaches to anger regulation assessment originate from a personality framework that views responses to anger as chronic, long-standing personality characteristics. State-based approaches to anger regulation, on the other hand, conceptualize anger regulation as temporary reactions to and management of anger, as conceptualized by the CARM. The CARM is a state-based anger measure that was developed based on discrete emotion theories (O'Neal et al., under review). Unlike other anger regulation measures, which are guided by psychopathology and personality frameworks, the CARM does not take a value-laden, maladaptive approach to the conceptualization of anger regulation. Rather, anger regulatory strategies are regarded as neutral, but could also be adaptive, depending on the context. For example, the item "When I was angry, I would go off by myself" may refer to an adaptive strategy, depending on what the child does after going off by themselves (e.g., deep breathing). CARM items are phrased to capture recent strategy use and stand in contrast to existing anger regulation measures that phrase items to tap into trait-like, personality patterns (e.g., "I am hotheaded"; Brunner & Spielberger, 2010).

The CARM's largely neutral approach helps to capture a range of strategies beyond dichotomous adaptive/maladaptive behavior and creates opportunities to examine the relation between anger regulation and positive outcomes. The measure is also unique in including a pause anger scale which captures "mindful" responses to anger, along with expressive scales that clearly distinguish with whom the child shares their anger.

were no signifi

achievement. Given the limited evidence for either moderation or mediation, this study will explore, rather than hypothesize, the question of whether or not emotional engagement acts as a moderator or mediator.

In sum, the theory and literature reviewed lay the groundwork for our hypotheses. Emotion theories (i.e., Affect Theory, DET) support the need for research on emotion-specific regulatory strategies, like anger regulation, rather than a "global" emotion regulation construct (Izard, 1977; Tomkins, 1963). Moreover, emotions theory and the literature point to the importance of examining the relation between anger regulation and positive outcomes, rather than a sole focus on the negative consequences of maladaptive anger regulation on outcomes such as psychopathology. A limited number of studies have largely found emotion regulation to be related to achievement (e.g., Graziano et al., 2007). Only one study has examined achievement as an outcome of anger regulation among elementary-aged students (Boekaerts, 1994), supporting the need to test the assumption that adaptive anger regulation may lead to positive learning and elementary-aged achievement outcomes. Finally, the engagement literature has supported emotional engagement as potentially playing a protective role via moderation (e.g., Zhou et al., 2010). It is not yet clear, though, if emotional engagement acts as a mediator to explain the relations between anger regulation and achievement outcomes.

Hypotheses

1. Anger regulation strategies will have a positive relation with later achievement test scores. We explore which of the anger regulation strategies explain the most variation in later achievement, when controlling for other anger regulation strategies.
2. We also explore if anger regulation'

Table 1. Demographics.

	N	%
Child sex		
Female	151	60
Age		
8 years	23	9
9 years	83	33
10 years	93	37
11 years	52	21
Ethnicity		
Asian	13	5
Black	25	10
Latina/o	14	6
White	155	62
Multiracial	29	17
Dual language learner	91	36
Highly gifted center	52	21
Schools		
School 1	122	49
School 2	129	51
Administration format		
Group	46	18
Individual	205	82

Note: Total n= 251.

permit researchers to ask students or parents about their socioeconomic or immigrant generational status.

Procedures

All procedures were approved by the school district and university institutional research committees. The procedures included verbal student assent and written parent and teacher consent. Students were recruited from all 27 upper elementary classrooms across the two schools. Thirty-six percent of students agreed to participate. The recruitment rate ranged from 12% to 67% per class. Analyzes controlled for potential class cluster effects. The two schools were selected due to the principals' and teachers' interest in this study; when we met with the parent-teacher associations at both schools, the parent representatives were also interested. The schools were in a mid-Atlantic, U.S. location, with catchment areas that ranged in wealth from low-income to high-income. We did not conduct a priori power analyzes before data collection. The sample was a convenience sample, as was the sample size of 251. This sample size was dependent on the number of students who chose to participate across the two schools.

As a part of a larger study, students completed questionnaires at three time points (March; April to May; June 2015). This multimethod study used the first of those time

points (March 2015; Time 1 [T1]) for student-reported anger regulation, student- and teacher-reported emotional engagement, and control variables. The achievement outcome (Measure of Academic Performance [MAP] task) was collected in a separate testing process conducted by the school district from April to June 2015, between one and three months after T1 measures were collected (T2).

Researchers read the anger regulation questionnaire out loud in English to each student, in one-on-one sessions during the school day, to ensure that all students understood the questions, given that 36% were dual language learners. Participants could read along with hard copies of the questionnaire. Eighteen percent of students' questionnaire data were collected in a small group setting due to time constraints; therefore, question-

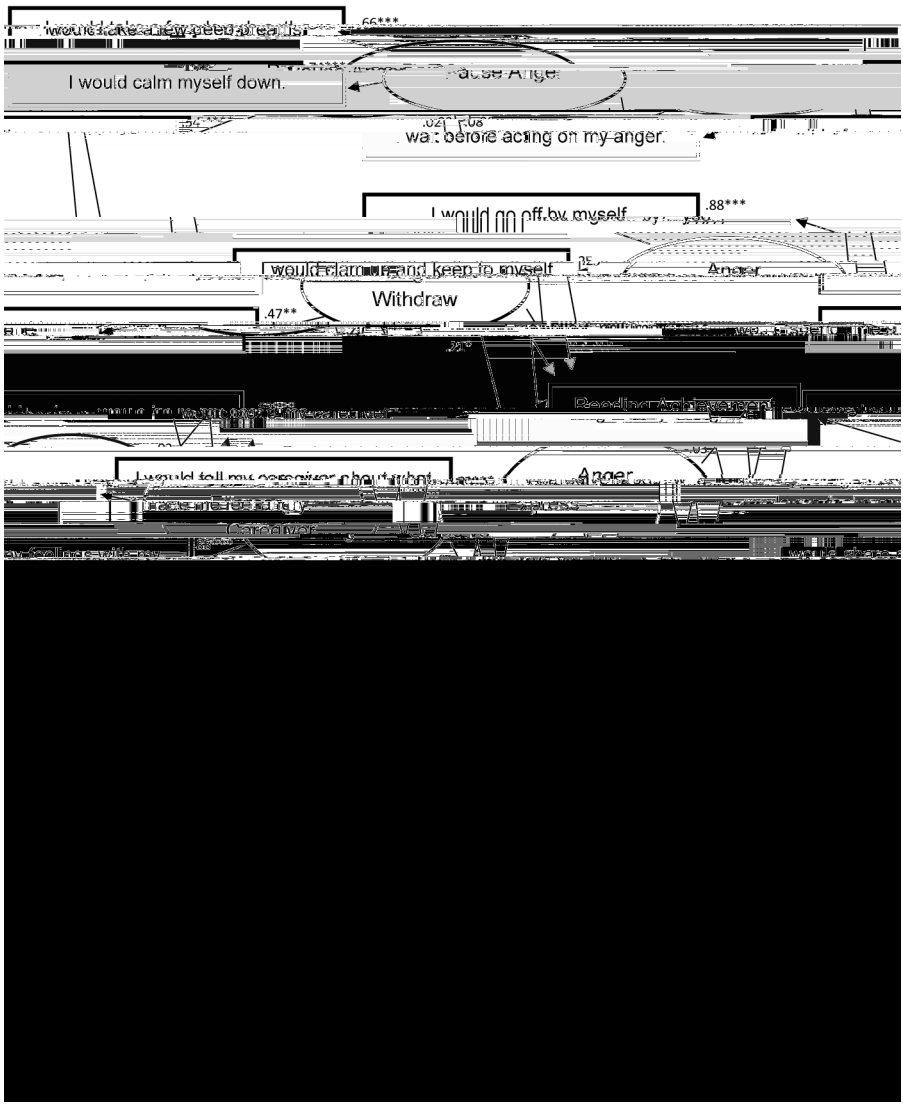

Figure 1. Latent anger regulation relations with later observed achievement.
Note: Estimates for each path/indicator are standardized; significance is indicated by * <.05, ** <.01, *** <.001. Bolded path estimates indicate the significant paths from anger withdraw to reading and math achievement. The figure does not depict the control variables: anger frequency, age, gender, ethnicity, dual language status, questionnaire format, school, and gifted status.

the model, and the fit of the data to the model was adequate. We found that the CARM subscales' internal reliabilities were adequate, except for the anger withdraw scale which had an alpha of .56 (Table 2). Note that the use of structural equation modeling has a

Table 2. Bivariate correlations and descriptives.

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Mean	SD	n
1. Pause Anger	—																3.58	.84	.67 248
2. Anger Withdraw	.10	—															3.24	.84	.56 247
3. Express Anger-Caregiver	.24*	.02	—														3.32	1.00	.82 249
4. Express Anger-Friend	.39*	.11	.34*	—													2.74	.98	.71 250
5. Express Anger-Teacher	.23*	.06	.40*	.37*	—												2.25	1.01	.89 250
6. MAP-R	.04	.14	.05	.04	.07	—											223.95	14.47	— 236
7. MAP-M	.00	.12	.05	.03	.07	.83*	—										228.86	17.46	— 235
8. Age	.00	.07	.01	.09	.22*	.46*	.51*	—									9.69	.90	—

methodological advantage of using latent rather than observed variables. The use of a factor as a latent rather than an observed factor reduces the impact of the observed subscale's low reliability, given that "latent variable models can control measurement error better than observed-variable models" (Kline, 2015, p. 15). For instance, the use of an anger withdraw latent factor in this study, rather than an observed anger withdraw subscale, may reduce the impact of measurement error associated with anger withdraw's low internal reliability. Using the same sample, test-retest correlations for each of the observed anger regulation strategies were moderate-strong, and all the CARM subscales were associated with concurrent emotional engagement (O'Neal et al., under review). Anger frequency was assessed as the first item in the CARM via one item asking students to rate how often they felt angry or frustrated over the past month (1 = Never, 5 = Very often). This anger frequency item is typically used as a control in CARM studies. Anger frequency is important as a control variable when the CARM is used because it is likely that emotion regulation strategy use is dependent on the individual's frequency of experiencing the emotion.

Emotional engagement. Emotional engagement is conceptualized as a student's positive

skill-adaptive test used by the school district for benchmarking, academic growth tracking, and accountability. Average standardized scores in this study ranged from 198.6 to 211.8; the total possible range is 120–250. MAP has been used for children in second grade through high school, and the internal and test-retest reliabilities are high (Northwest Evaluation Association, 2009).

Analyzes

Mplus version 8.2 (Muthén & Muthén, 1998–2017) was used for latent variable path analysis (LVPA). LVPA included anger regulation latent subscales predicting observed reading and math achievement. Moderation analyzes tested the interaction of latent emotional engagement (observed student- and teacher-reported emotional engagement items loaded onto respective fi

SRMR = .056); the standardized loadings ranged from .34 to .95. All of the loadings were significant, except for an item loading onto the anger withdraw factor: "When I was angry, I would spend time alone." The second-order emotional engagement measurement model fit was adequate for the SRMR and CFI indices and approaching adequate for the RMSEA (RMSEA = .077; CFI = .967; SRMR = .051). All of the emotional engagement loadings were significant; the standardized loadings ranged from .50 to .92. The details on the factor loadings of the items onto the AR and engagement factors are supplementary analyzes.

We controlled for student-reported anger frequency, age, gender, ethnicity, dual language status, questionnaire format, school, and gifted status. We adjusted for possible teacher cluster effects in Mplus via the type = complex procedure. MAP scores from fifteen participants were missing by the time the MAP outcome was assessed between one and three months later. A restricted maximum likelihood robust standard error estimation approach was used (i.e., MLR), which can handle non-normal data and accommodate missingness and small samples (Muthén & Muthén, 1998–2017). Regarding model fit, the recommended RMSEA cutoff is less than .06, CFI cutoff is more than .95, and SRMR cutoff is less than .08 (Hu & Bentler, 1999).

Results

Descriptives, reliability, and correlations

Anger regulation scales all had means close to three, on a scale from one to five; pause anger was highest and express teacher was lowest (Table 2). Mean percentiles of achievement outcomes were the 82nd percentile for MAP-R and 78th percentile for MAP-M; mean standardized scores were 224 for MAP-R and 229 for MAP-M.

The internal reliabilities of the anger regulation scales were adequate, except for the anger withdraw scale which had an alpha of .56 (Table 2); however, as addressed above, internal reliability is not a major concern given that we use latent modeling (Hancock & Mueller, 2013). Anger regulation variables were correlated with each other, except for anger withdraw. The correlation of anger frequency was significant and negative with pause anger, express teacher, and express friend but positive with anger withdraw. Surprisingly, bivariate correlations between anger regulation and achievement were not significant. Student-reported emotional engagement demonstrated a significant association with all the anger regulation strategies, but it had a negative association with anger withdraw; like anger regulation, student-reported emotional engagement was not associated with achievement. Teacher-reported emotional engagement was associated with pause anger, and it was associated with MAP-R.

Relation of anger regulation with later achievement

When all of the latent anger regulation variables were in a model with later observed reading and math achievement as the outcomes, anger withdraw had a positive, significant relation with both MAP-R and MAP-M (see results in Figure 1 and Table 3).

Table 3. The relation of latent anger regulation factors with later standardized achievement.

	MAP-reading		MAP-math
	Unstand. estimate (SE)	Standardized estimate (SE)	

Table 3. Continued

	MAP-reading				MAP-math			
	Unstand. estimate (SE)	Standardized estimate (SE)	Unstand. estimate (SE) p-value	Unstand. estimate CI	Unstand. estimate (SE)	Standardized estimate (SE)	Unstand. estimate (SE) p-value	Unstand. estimate CI
Age	4.42(.85)	.28(.06)	.000	(2.75, 6.09)	6.93(1.09)	.36(.06)	.000	(4.80, 9.07)
Gender (Female)	2.07(1.25)	.07(.04)	.10	(-.37, 4.52)	.29 (1.35)	.01(.04)	.83	(-2.35, 2.93)

Note: Bolded rows are significant; AE stands for Anger Express; Unstand. stands for Unstandardized; DLL stands for Dual Language Learning status. The controls included anger frequency, gifted status, DLL, questionnaire format (group or individual), school, age, and gender.

Therefore, higher anger withdraw led to better achievement outcomes than lower anger withdraw. Unlike anger withdraw, express and pause anger did not have significant relations with MAP outcomes when controlling for other anger regulation latent variables. With or without the other anger regulation factors in the model, anger withdraw had a significant relation with later achievement outcomes. The model fit was adequate, RMSEA = .03; CFI = .98; SRMR = .05.

Moderation by emotional engagement

We tested the moderating effect of latent second-order student- and teacher-reported emotional engagement on the prediction of later achievement by latent anger withdraw, given that anger withdraw demonstrated the only significant relation of the five anger regulation factors with later achievement. Emotional engagement was a significant mod-

Discussion

The main goal of this short-term study was to examine if, and for whom, anger regulation predicts later achievement. Indeed, the contribution of this study was elucidating the roles of anger-specific regulation and emotional engagement in achievement, with implications for socioemotional learning and resilience in school. Latent anger withdraw had signifi-

if the student struggling with withdrawing from anger is emotionally engaged in school, then they are more likely to learn and achieve effectively in reading. Perhaps, the benefits of positive emotions that are typically associated with emotional engagement, such as pride and enjoyment, may mitigate the negative consequences of low anger withdraw for later reading achievement. It is difficult to speculate why emotional engagement has a protective effect on anger withdraw's prediction of reading, but not math, achieve-

Conclusions, implications, and future directions

regulation strategies would be a contribution, like the re-operationalization of the strategy

Brunner, T. M., & Spielberger, C. D. (2010). The state trait anger expression inventory for children and adolescents (STAXI-C/A). Psychological Assessment Resources. https://doi.org/10.1002/9780470479216.corpsy0942.

Camacho-Morles, J., Slemp, G. R., Pekrun, R., Loderer, K., Hou, H., & Oades, L. G. (2021). Activity achievement emotions and academic performance: A meta-analysis. Educational Psychology Review, 33(3), 1051–1095. https://doi.org/10.1007/s10648-020-09585-3

Campos, J. J., Frankel, C. B., & Camras, L. (2004). On the nature of emotion regulation. Child Development, 75(2), 377–394. https://doi.org/10.1111/j.1467-8624.2004.00681.x

Cicchetti, D., Ackerman, B. P., & Izard, C. E. (1995). Emotions and emotion regulation in developmental psychopathology. Development and Psychopathology, 7(1), 1–10. https://doi.org/10.1017/S0954579400006301

Cole, P. M., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. Child Development, 75(2), 317–333. https://doi.org/10.1111/j.1467-8624.2004.00673.x

Cole, P. M., Zahn-Waxler, C., Fox, N. A., Usher, B. A., & Welsh, J. D. (1996). Individual differences in emotion regulation and behavior problems in preschool children. Journal of Abnormal Psychology, 105, 518–529. https://doi.org/10.1037/0021-843X.105.4.518

del Barrio, V., Aluja, A., & Spielberger, C. (2004). Anger assessment with the STAXI-C/A: Psychometric properties of a new instrument for children and adolescents. Personality and Individual Differences, 37(2), 227–244. https://doi.org/10.1016/j.paid.2003.08.014

Dougherty, L. R. (2006). Children's emotionality and social status: A meta-analytic review. Review of Social Development, 15(3), 394–417. https://doi.org/10.1111/j.1467-9507.2006.00348.x

Duckworth, A., & Gross, J. J. (2014). Self-control and grit: Related but separable determinants of success. Current Directions in Psychological Science, 23(5), 319–325. https://doi.org/10.1177/0963721414541462

Farmer, A. S., & Kashdan, T. B. (2012). Social anxiety and emotion regulation in daily life: Spillover effects on positive and negative social events. Cognitive Behavioral Therapy, 41(2), 152–162. https://doi.org/10.1080/16506073.2012.666561

Graziano, P. A., Reavis, R. D., Keane, S. P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. Journal of School Psychology, 45(1), 3–19. https://doi.org/10.1016/j.jsp.2006.09.002

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. Review of General Psychology, 2(3), 271–299. https://doi.org/10.1037/1089-2680.2.3.271

Gross, J. J. (2001). Emotion regulation in adulthood: Timing is everything. Current Directions in Psychological Science, 10(6), 214–219. https://doi.org/10.1111/1467-8721.00152

Hancock, G. R., & Mueller, R. O. (Eds.). (2013). Structural equation modeling: A second course (2nd ed.). Information Age Publishing, Inc.

Harley, J. M., Pekrun, R., Taxer, J. L., & Gross, J. J. (2019). Emotion regulation in achievement situations: An integrated model. Educational Psychologist, 54(2), 106–126. https://doi.org/10.1080/00461520.2019.1587297

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1–55. https://doi.org/10.1080/10705519909540118

Izard, C. (1977). Human emotions (Emotions, personality, and psychotherapy). Plenum Press.

Izard, C. E., Libero, D. Z., Putnam, P., & Haynes, O. M. (1993). Stability of emotion experiences and their relations to traits of personality. Journal of Personality and Social Psychology, 64(5), 847–860. https://doi.org/10.1037//0022-3514.64

Kashdan, T. B., Young, K. C., & Machell, K. A. (2015). Positive emotion regulation: Addressing two myths. Current Opinion in Psychology, 3, 117–121. https://doi.org/10.1016/j.copsyc.2014.12.012

Kline, R. B. (2015). Principles and practice of structural equation modeling (4th ed.). Guilford Press.

Kosky, C., & Curtis, R. (2008). An action research exploration integrating student choice and arts activities in a sixth-grade social studies classroom. Journal of Social Studies Research, 32(1), 22–27.

Lantieri, L. (2008). Building inner resilience. Reclaiming Children and Youth, 17(2), 43–46.

Linehan, M. M. (2014). DBT training manual. The Guilford Press.

Mazza, J. J., Dexter-Mazza, E. T., Miller, A. L., Rathus, J. H., Murphy, H. E., & Linehan, M. M. (2016). DBT Skills in schools: Skills training for emotional problem solving for adolescents (DBT STEPS-A). Guilford Press.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., Houts, R., Poulton, R., Roberts, B. W., Ross, S., Sears, M. R., Thomson, W. M., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. Proceedings of the National Academy of Sciences, 108(7), 2693–2698. https://doi.org/10.1073/pnas.1010076108

Muthén, L. K., & Muthén, B. O. (1998–2017). Mplus user s guide (8th ed.). Muthén & Muthén.

Ng, L. V., & Khor, K. L. (2018). Anger experience and expression among adoelscents: A test of the STAXI-2 C/A. Advances in Social Science, Education and Humanities Research, 3, 109–112. https://doi.org/10.2991/acpch-17.2018.55

Northwest Evaluation Association (2009). Technical manual for measures of academic progress and measures of academic progress for primary grades . Northwest Evaluation Association.

O'Neal, C. R. (2000). Paths of resilience: A contextual-moderator analysis of exposure to community violence and behavioral functioning among inner city youth (Publication no. 9978688) [Doctoral dissertation, Long Island University, Brooklyn]. ProQuest Dissertations Publishing.

O'Neal, C. R., & Magai, C. (1997). Emotions as a Child. Unpublished measure.

O'Neal, C. R., Meyering, K., Babaturk, L., & Gosnell, N. (under review). Child Anger Regulation Measure (CARM): Psychometric properties and prediction of emotional engagement.

Park, S., Holloway, S., Arendtsz, A., Bempechat, J., & Li, J. (2012). What makes students engaged in learning? A time-use study of within- and between-individual predictors of emotional engage-

Shah, P. E., Weeks, H. M., Richards, B., & Kaciroti, N. (2018). Early childhood curiosity and kindergarten reading and math academic achievement. Pediatric Research, 84(3), 380–386. https://doi.org/10.1038/s41390-018-0039-3

Shaver, P. R., Wu, S., & Schwartz, J. C. (1992). Cross-cultural similarities and differences in emotion and its representation. In M. S. Clark (Ed.), Emotion (pp. 175–212). Sage Publications.

Skibbe, L., Montroy, J., Bowles, R., & Morrison, F. (2019). Self-regulation and the development of literacy and language achievement from preschool through second grade. Early Childhood Research Quarterly, 46, 240–251. https://doi.org/10.1016/j.ecresq.2018.02.005

Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. Journal of Educational Psychology, 85(4), 571–581. https://doi.org/10.1037/0022-0663.85.4.571

Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? Journal of Educational Psychology, 100(4), 765–781. https://doi.org/10.1037/a0012840

Spielberger, C. D., Johnson, E. H., Russell, S. F., Crane, R. J., Jacobs, G. A., & Worden, T. J. (1985). The experience and expression of anger: Construction and validation of the anger expression scale. In M. A. Chesney & R. H. Rosenman (Eds.), Anger and hostility in cardiovascular and behavioral disorders (pp. 5–30). Hemisphere Publishing Corporation.

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