European Journal of Psychology of Education
https://doi.org/10.1007/s10212-019-00414-y

Linking academic performance to optimistic attributional style: attributions following positive events matter most

Tamara Gordeeva[1,2] · Kennon Sheldon[3,4] · Oleg Sychev[5]

Received: 25 June 2018 / Revised: 18 December 2018 / Accepted: 30 January 2019
Published online: 08 March 2019

Abstract
Optimistic attributional style has been shown to be reliably associated with high well-being and low depression and (Hu et al., *Journal of Social and Clinical Psychology*, 34(4): 304–321, 2015). Via both a meta-analysis and two new studies, we examine the relationship between optimistic attributional style for explaining negative and positive events, and academic performance. In the meta-analysis, dispositions to make stable and global attributions for positive events were more strongly related to academic achievement ($d = 0.21$, $k = 30$, $N = 6351$) than dispositions to make unstable and local attributions regarding negative events ($d = 0.11$, $k = 66$, $N = 11{,}023$). Academic level (primary school vs secondary school vs university) and type of test (general vs achievement-specific) were shown to moderate the associations. The two new studies were designed to address the remaining questions. In both studies, optimistic attributional style for positive events most reliably predicted student academic achievement, including boosted achievement over time. Possible explanations for the moderator effects are discussed, and recommendations for future research as well as practical recommendations are provided.

Keywords Academic performance · Optimistic attributional style · Meta-analysis · Positive and negative events · Achievement events · Academic level

Research on attributional styles (dispositions for explaining one's own life-outcomes) has focused primarily on the relations of style with mental health. Less research has focused on the relationship between attributional style and achievement, despite the fact that this was the

✉ Tamara Gordeeva
tamgordeeva@gmail.com

Kennon Sheldon
SheldonK@missouri.edu

Oleg Sychev
osn2@mail.ru

Extended author information available on the last page of the article

original focus of attribution research (Weiner 1974). Also, the extant achievement research has concentrated on optimism following negative events rather than optimism following positive events, and has yielded a rather mixed picture. In this article, we attempt to clarify the picture, via a meta-analysis and via two new studies. We will show that academic performance is better promoted by optimism based on stable and global explanations of good events, rather than by optimism based on unstable and specific explanations of negative events.

In the historical narrative below, we briefly summarize the long history of attributional style research. In so doing, we will show that, although our contention regarding the stronger effects of optimism regarding positive events has not often been tested, when it has, it has received support.

Attributional style applied to depression and well-being

Drawing from Weiner's (1974) work, Abramson et al. (1978) introduced the construct of *attributional style*, which refers to how people habitually explain the causes of different events in their lives. According to these researchers, people with an optimistic attributional style (OAS) habitually view good events as caused by factors that are internal (to them), stable (i.e., permanent rather than changeable), and global (i.e., affecting all parts of life rather than just one specific part), and they view bad events as caused by factors that are external, unstable, and specific (Peterson et al. 1982). Conversely, those with a pessimistic style explain good events as caused by factors that are external, unstable, and specific, and bad events as caused by factors that are internal, stable, and global.

Initially, it was hypothesized that people with a pessimistic attributional style are more prone to depression. Indeed, studies by M. Seligman, C. Peterson, and their colleagues and then meta-analyses (Hu et al. 2015; Peterson et al. 1985; Sweeney et al. 1986) confirmed that pessimism is a reliable predictor of depression. Other studies generalized the effects of pessimistic attributional style to other negative outcomes including physical illness (Peterson 1995; Peterson and Seligman 1984), health (Dosedlová et al. 2015; Yuan and Wang, 2016), and anxiety (Lynd-Stevenson and Rigano 1996; Ralph and Mineka 1998). Furthermore, pessimistic style predicts lower scores on positively valenced outcomes such as positive affect, life-satisfaction, and self-esteem (Cheng and Furnham 2001, 2003, Rigby and Huebner 2005, Sanjuán and Magellares 2009).

Attributional style applied to academic performance

Weiner's (1974) attributional theory of achievement motivation addressed the question of how peoples' explanations for achievement-related outcomes affect their emotional and behavioral reactions to those outcomes. Early research showed that people with high achievement motivation tend to differ in their attributions for success and failure, compared to those low in achievement motivation: high achievers attribute their successes to ability and effort, not luck, and attribute their failures to lack of effort, not lack of ability (Weiner 1979).

Seligman, Peterson, and colleagues later suggested that having an optimistic attributional style boosts achievement at school, university, and work (Peterson and Barrett 1987; Seligman and Schulman 1986; Seligman 1991). Their reasoning was that optimistic thinking enhances positive expectancies and stimulates persistence after failure (Seligman and Schulman 1986).

Conversely, people with a pessimistic explanatory style tend to have vague goals and to behave in a passive and fatalistic manner, rather than using active coping strategies to resolve problems.

The original focus of most research linking optimistic attributional style and academic performance was optimism following *negative* events (OAS_N), as justified by the helplessness theory of depression and its extension, hopelessness theory (Abramson et al. 1989), as well as by the clinical focus of these two theories. Following this tradition, some researchers have indeed limited the definition of OAS to explanations of negative events (e.g., Dykema et al. 1996; Jackson et al. 2002; Peterson and Barrett 1987). A similar imbalance is obtained in studies of the relationship between attributional style and academic performance; mostly, attributions regarding negative events have been studied (Perry et al. 2008).

However, the empirical link between OAS_N and academic achievement has been inconsistent and sometimes contradictory. For example, Peterson and Barrett (1987) found that low OAS_N was a reliable predictor of poor academic performance in college students, a pattern that was later confirmed with schoolchildren (Yates et al. 1995). However, subsequent studies showed no relationship between OAS_N and the academic achievement of university students and high school students (e.g., Bridges 2001; Houston 2016; Yee et al. 2003), while others reported that pessimistic students can actually perform better than their more optimistic counterparts (e.g., Houston 1994; LaForge and Cantrell 2003).

Optimism regarding positive events and academic performance

Somewhat later, researchers began to specifically consider the importance of peoples' optimistic attributional styles for explaining *positive* events (OAS_P) (Needles and Abramson 1990). Again, OAS_P involves explaining good outcomes (such as doing well on a test, at a competition, or on a date) as being due to factors that are internal, global and stable (Peterson et al. 1982). However, OAS_P has received much less research attention overall, including in the achievement domain. Although there is less information to draw from, it appears that OAS_P may indeed be important for predicting academic and achievement outcomes. For example, Yates et al. (1995) found that in elementary Australian schoolchildren, OAS_P was more strongly associated with mathematics achievement over 2 years than OAS_N. In a recent large-scale study of British high school students, Houston (2016) found that OAS_P predicts concurrent academic performance (see also Boyer 2006; Henry et al. 1993).

Unfortunately, little research has *directly* compared OAS_P and OAS_N as predictors of outcomes. Reasons include the fact that some researchers followed Peterson's (1991) recommendations and measured only attributional style for negative events (Dykema et al. 1996; Hilsman and Garber 1995; Kent and Martinko 1995; Travers et al. 2015), and the fact that sometimes when OAS_P *is* assessed, it is simply subsumed into a single OAS composite (e.g., Ciarrochi et al. 2007; Leeson et al. 2008; Thompson et al. 1998), rather than being examined separately. Given the relative independence of the two constructs (Peterson 1991; Xenikou et al. 1997; Zautra et al. 1985), this is a procedure which is open to question from an empirical standpoint.

Nevertheless, some research has directly compared OAS_N and OAS_P in studies of academic achievement. Our first research goal was simply to meta-analyze this literature. One of the major advantages of meta-analysis is that it allows consideration of systematic variations between studies (Hunter and Schmidt 2004; Steel and Kammeyer-Mueller 2002).

Our main research goal was to show that feeling *optimism regarding the stability and pervasiveness of good events* is more important for supporting or boosting academic achievement, than is *optimism regarding the temporariness and specificity of bad events*. This hypothesis is consistent with recent Houston (2016) which found that in schoolchildren OAS_P predicts academic performance, whereas OAS_N does not. We based this hypothesis on the "broaden and build" theory of positive emotions (Fredrickson 2009), which says that positive emotions help people to develop their "thought-action repertoires," that is, they facilitate the processes of learning and growth. We suggest that the positive emotions provided by optimistic assessments of positive events ("they will continue and will proliferate throughout my life!") help activate and maintain the broaden-and-build process within learning environments, more directly than optimistic assessments of negative events, which primarily involve feelings of relief ("thank god, that probably won't happen, or will soon end!"). We suggest that a habit to explain good outcomes as due to stable, global, and internal factors might impact academic self-efficacy, also helping students to set achievable goals and to better self-regulate (Bandura 1997).

Potential moderators of associations between optimistic attributional style and academic performance

Two main potential moderators of the relationship between optimistic attributional style (OAS) and academic performance were also examined in this research—academic level and type of test. Previous researchers have found that as the participant's academic level rises (from primary to tertiary education), the associations of personality and individual difference variables with performance weaken. For example, within older students, performance is less strongly predicted by personality traits (all Big Five traits except Conscientiousness, Poropat 2009) and by intelligence (Jensen 1980). Interestingly, a recent study of relationships between growth mindset and academic performance found significant correlations in primary and secondary school student samples but no significant correlation in an adult sample (Sisk et al. 2018).

The increasing diversity of educational and assessment practices at higher levels of education (Tatar 1998) could help to explain such heterogeneity. Alternatively, the moderating effect of academic level may be due to the presence of methodological artifacts, such as restriction of range at higher levels of education (Chamorro-Premuzic and Furnham 2006). Regardless of the explanation, in our meta-analysis we tested whether academic level (primary, secondary, or tertiary) moderates the size of the associations between academic performance and OAS, for both positive and negative events.

The second meta-analytic moderator we examined was type of test—general or domain-specific. In addition to the domain-general ASQ (Peterson et al. 1982), several specific versions of the ASQ have been used to examine the relationships between OAS and academic performance. The first and most widely used is Peterson and Barrett's (1987) Academic ASQ (AASQ) which is patterned similarly to the ASQ, but which refers only to negative academic outcomes (e.g., "You fail a final examination," "You cannot get started writing a paper"). Peterson and Barrett (1987) argued that their achievement-specific measure should better predict student grades. Although they showed the expected relation between the AASQ and grades, they did not compare the ASQ and AASQ measures. Via similar reasoning, Bandura argued that domain-specific self-efficacy is a better predictor of outcomes than general self-

efficacy (Bandura 1997). We tested for the presence of such a moderator (general vs academic-specific) in our studies.

Meta-analysis: the relationship between OAS_N, OAS_P, and academic achievement

We first conducted a meta-analysis of the existing literature, focusing on the associations of OAS_N and OAS_P with academic achievement. The criteria for including a study in meta-analysis were as follows: (1) a measure of an attributional style for positive events or negative events or both was collected; (2) a measure of academic achievement—course exam (e.g., midterm exam), course grade, average of course grades (e.g., GPA), or standardized test performance—was collected; (3) a bivariate correlation coefficient reflecting the relationship between attributional style and academic achievement was reported, or enough information was provided to compute this effect size.

We found 61 publications in Scopus, Web of Science, and ProQuest Dissertations databases using the following keywords: attributional style, explanatory style, optimism, pessimism, academic achievement ("(optimis* OR pessimis*) AND (attribution* OR explanatory) AND style AND (achievement OR performance OR success)"); we also asked colleagues through the SPSP network for unpublished studies, posters, presentations, etc. We included in the final analysis 43 publications because the rest ($k = 18$) did not contain the necessary information about the size and/or direction of the effects. Because some publications reported multiple effects regarding OAS for different outcome variables (e.g., different exams, SAT), we had data on 66 effects of OAS_N and 30 effects of OAS_P (all data are presented in Table 1). Collected effect sizes (r-to-z-transformed) with their confidence intervals and meta-analytical weights are presented on forest plots (see Fig. 1 for OAS_P and Fig. 2 for OAS_N).

Meta-analytic procedure

Pearson correlation (r) was used as an effect size measure. For findings presented using multiple regression, we used the β-to-r imputation formula (Peterson and Brown 2005) to estimate the effect size. All correlation coefficients were transformed to the Fisher's z scale prior to data analysis. Collected effect sizes were not all independent because findings based on one sample sometimes contained more than one relevant effect size. To deal with dependency of effect sizes and to retain statistical power in the meta-analysis, we used the robust variance estimation (RVE) approach with small-sample adjustments (Hedges et al. 2010) via the robumeta package for R (Fisher and Tipton 2015). To evaluate the heterogeneity of effects across studies, we used the I^2 coefficient (Higgins et al. 2003), which describes the percentage of total variation across studies that is due to heterogeneity rather than chance.

To estimate the effect sizes of OAS_P and OAS_N, an intercept-only meta-regression model was implemented. The intercept of this model can be interpreted as the overall effect size. For all analyses, the in-study effect size correlation (ρ) was set at 0.8. We conducted sensitivity analyses across varying values of ρ (0.0, 0.2, 0.4, 0.6, 0.8, 1.0) to check the robustness of the coefficient of meta-regression, standard error, and between-study variance in study-average effect size values.

Table 1 Summary of studies and samples included in the meta-analysis

Study	*N*	*r* (OAS_P)	*r* (OAS_N)	Measure	Type of test	Academic performance measure	Main finding
Primary school							
Dostal (2000) – M1	29	0.44	0.24	CASQ	G	SAT-9 subscale scores (reading total)	Significant positive effect of OAS_P and no effect of OAS_N
Dostal (2000) – M2	29	0.09	0.35	CASQ	G	SAT-9 subscale scores (math total)	No significant effect of OAS_P and OAS_N
Dostal (2000) – M3	29	0.52	0.11	CASQ	G	SAT-9 subscale scores (language)	Significant positive effect of OAS_P and no effect of OAS_N
Dostal (2000) – M4	29	0.24	0.12	CASQ	G	SAT-9 subscale scores (spelling)	No significant effect of OAS_P and OAS_N
Gordeeva et al. (2018)	182	0.23	0.13	CASQ	G	GPA	Significant positive effect of OAS_P and no effect of OAS_N
Khodayarifard et al. (2010)	179	0.01	0.12	CASQ	G	Teacher ratings of academic performance	No significant effect of OAS_P and OAS_N
Khodayarifard (1996)	554	0.03	0.08	CASQ	G	Teacher ratings of academic performance	No significant effect of OAS_P and OAS_N
Yates et al. (1995)	145	0.20	0.30	CASQ	G	Progressive Achievement Tests in Mathematics	Significant positive effect of OAS_P and significant positive effect of OAS_N
Yates (1999) – M1	243	0.19	0.21	CASQ	G	Progressive Achievement Tests in Mathematics	Significant positive effect of OAS_P and significant positive effect of OAS_N
Yates (1999) – M2	243	0.18	0.14	CASQ	G	Progressive Achievement Tests in Mathematics	Significant positive effect of OAS_P and significant positive effect of OAS_N
Secondary school							
Fallah (2014)	442	–	−0.05	ACSQ	G	Academic performance (self-reported 1 item)	No significant effect of OAS_N
Gordeeva et al. (2018)	206	0.37	0.30	CASQ	G	GPA	Significant positive effect of OAS_P and significant positive effect of OAS_N
Houston (2016)	979	0.27	0.01	EASQ	A	GCSE public examinations	Significant positive effect of OAS_P and no effect of OAS_N
Lieber (1996)	169	0.22	–	TASQ	G	GPA	Significant positive effect of OAS_P
University students							

Table 1 (continued)

Study	*N*	*r* (OAS_P)	*r* (OAS_N)	Measure	Type of test	Academic performance measure	Main finding
Bernieri et al. (2018)	138	0.05	0.14	ASQ	G	GPA	No significant effect of OAS_P and OAS_N
Berry (2007) – M1	188	0.25	0.05	AASQ	A	Exam grades	Significant positive effect of OAS_P and no effect of OAS_N
Berry (2007) – M2	188	0.21	0.10	AASQ	A	Course grades	Significant positive effect of OAS_P and no effect of OAS_N
Boyer (2006) – M1	48	0.37	−0.19	CAVE	G	Final exam	Significant positive effect of OAS_P and no effect of OAS_N
Boyer (2006) – M2	48	0.07	−0.27	CAVE	G	Midterm exam	No significant effect of OAS_P and OAS_N
Bridges (2001)	127	−0.08	−0.06	ASQ	G	Course-based objective examinations	No significant effect of OAS_P and OAS_N
Eppler et al. (2000)	153	–	0.18	AASQ	A	GPA	Significant positive effect of OAS_N
Flores (2007)	250	0.03	0.06	ASQ	G	GPA	No significant effect of OAS_P and OAS_N
Fox (2006) – M1	57	–	0.24	AASQ	A	GPA for the first semester	No significant effect of OAS_N
Fox (2006) – M2	52	–	0.16	AASQ	A	GPA for the second semester	No significant effect of OAS_N
Fox (2006) – M3	39	–	0.01	AASQ	A	GPA for the third semester	No significant effect of OAS_N
Gibb et al. (2002)	109	–	−0.11	CSQ	G	GPA, 5-year cumulative	No significant effect of OAS_N
Gordeeva and Osin (2011)	87	−0.08	−0.26	ASQ-A	G	Average exam grade	Significant negative effect of OAS_N and no effect of OAS_P
Hale (1993) – M1	92	−0.08	−0.01	ASQ	G	GPA at the end of their freshman year	No significant effect of OAS_P and OAS_N
Hale (1993) – M2	92	−0.01	−0.10	ASQ	G	GPA in the middle of their junior year	No significant effect of OAS_P and OAS_N
Henry et al. (1993)	35	0.26	0.12	ASQ	G	Final grades of a computer course	No significant effect of OAS_P and OAS_N
Hernandez (1995) – S1	39	–	−0.33	AASQ	A	GPA	Significant negative effect of OAS_N
Hernandez (1995) – S2	39	–	0.31	AASQ	A	GPA	No significant effect of OAS_N
Houston (1994) – S1	58	–	−0.28	ASQ	G	Voluntary midterm multiple choice psychology assessment test	Significant negative effect of OAS_N
Houston (1994) – S2	158	–	−0.11	ASQ	G	Compulsory end-of-term multiple choice psychology assessment examination	No significant effect of OAS_N

Table 1 (continued)

Study	*N*	*r* (OAS_P)	*r* (OAS_N)	Measure	Type of test	Academic performance measure	Main finding
Houston (1994) – S3	42	–	−0.32	ASQ	G	A-level score	Significant negative effect of OAS_N
LaForge and Cantrell (2003) – M1	116	–	−0.19	ASQ	G	Accumulated course points	Significant negative effect of OAS_N
LaForge and Cantrell (2003) – M2	116	–	−0.28	ASQ	G	GPA	Significant negative effect of OAS_N
Lee and Seligman (1997)	312	0.12	−0.09	ASQ	G	Higher GPA (better school performance)	Significant positive effect of OAS_P and no effect of OAS_N
Maleva et al. (2014)	171	–	0.15	AASQ	A	GPA	Significant effect of OAS_N
Martinez and Sewell (2000) – S1	32	–	0.42	AASQ	A	GPA	Significant positive effect of OAS_N
Martinez and Sewell (2000) – S2	38	–	0.38	AASQ	A	GPA	Significant positive effect of OAS_N
McKenzie and Schweitzer (2001)	197	0.18	0.03	ASQ	G	GPA	Significant positive effect of OAS_P and no effect of OAS_N
Metalsky et al. (1987)	94	–	−0.03	ASQ	G	Midterm exam	No significant effect of OAS_N
Morris and Tiggerman (2013) – S1, M1	288	–	−0.08	AASQ	A	GPA	No significant effect of OAS_N
Morris and Tiggerman (2013) – S1, M2	291	–	−0.19	AASQ	A	Short Answer exam 1	Significant negative effect of OAS_N
Morris and Tiggerman (2013) – S1, M3	276	–	−0.13	AASQ	A	Short Answer exam 2	Significant negative effect of OAS_N
Morris and Tiggerman (2013) – S2, M1	255	–	0.02	AASQ	A	GPA	No significant effect of OAS_N
Morris and Tiggerman (2013) – S2, M2	292	–	0.10	AASQ	A	Short Answer exam 1	No significant effect of OAS_N
Morris and Tiggerman (2013) – S2, M3	291	–	0.09	AASQ	A	Short Answer exam 2	No significant effect of OAS_N
Musgrave-Marquart et al. (1997)	161	–	0.12	AASQ	A	GPA	No significant effect of OAS_N
Peterson and Barrett (1987)	87	–	0.36	AASQ	A	GPA	Significant positive effect of OAS_N
Pierce and Henry (1993)	682	0.03	0.08	ASQ	G	Final grade in college algebra course	Significant positive effect of OAS_N and no effect of OAS_P

Table 1 (continued)

Study	*N*	*r* (OAS_P)	*r* (OAS_N)	Measure	Type of test	Academic performance measure	Main finding
Ralph and Mineka (1998)	141	–	−0.02	EASQ	G	Grade received on introductory psychology course exam	No significant effect of OAS_N
Rowe and Lockhart (2005)	179	–	0.25	EASQ	G	Final grade at the end of the course of psychology and sociology	Significant positive effect of OAS_N
Satterfield et al. (1997)	387	−0.14	−0.05	ASQ	G	Cumulative GPA	Significant negative effect of OAS_P and no effect of OAS_N
Schulman (1995) – S1	289	−0.18	−0.11	ASQ	G	Predictive index (a weighted average of SAT scores, achievement test scores, and high school rank)	Significant negative effect of OAS_P and no effect of OAS_N
Schulman (1995) – S2	175	0.15	0.19	ASQ	G	Predictive index (a weighted average of SAT scores, achievement test scores, and high school rank)	Significant positive effect of OAS_P and significant positive effect of OAS_N
Peterson et al. (1988)	121	–	0.38	AASQ	A	Course grade	Significant positive effect of OAS_N
Tiggemann and Crowley (1993)	37	–	−0.03	AASQ	A	Performance on Reexamination (Grade)	No significant effect of OAS_N
Tippett (2006) – S1	52	–	0.33	AASQ	A	GPA	Significant positive effect of OAS_N
Tippett (2006) – S2	71	–	−0.02	AASQ	A	GPA	No significant effect of OAS_N
Villanova et al. (1988)	60	–	0.39	AASQ	A	Test	Significant positive effect of OAS_N
Ward (2003)	100	–	−0.14	AASQ	A	GPA	No significant effect of OAS_N
Yee et al. (2003) – M1	96	–	−0.01	ASQ	G	Introductory psychology course exam 1	No significant effect of OAS_N
Yee et al. (2003) – M2	96	–	0.01	ASQ	G	Introductory psychology course exam 2	No significant effect of OAS_N
Yee et al. (2003) – M3	96	–	−0.11	ASQ	G	Introductory psychology course exam 3	No significant effect of OAS_N
Yee et al. (2003) – M4	96	–	−0.24	ASQ	G	Introductory psychology course exam 4	Significant negative effect of OAS_N

r Pearson correlation (raw); *S1*, *S2*, etc. independent samples in the same study; *M1*, *M2*, etc. multiple measures in the same study; *A* test contains achievement situations; *G* test contains general life situations

We performed our moderator analyses within the RVE meta-regression model framework. Two separate meta-regression models were run for each moderator variable (academic level and type of test). The regression coefficients for categorical moderators represent the differences in mean effect sizes between the reference level of the moderator (intercept) and the comparison level (contrast). To test the difference among all levels of the moderator which has three levels (i.e., academic level), the Wald test function from the clubSandwich package (Pustejovsky and Tipton 2018) was used. This function conducts a Wald-type test of linear contrasts from a fitted linear regression model. An *F*-value indicates whether there is a difference among all levels of the moderator.

The results of analyses were made more practically meaningful by converting the correlations to Cohen's *d* (Olejnik and Algina 2000), which in this case can be interpreted as equivalent to the number of standard deviations between the mean levels of academic performance in groups that are either high or low on a specific OAS measure. It has been previously suggested that *d* effect sizes of around 0.2 can be considered as small, of around 0.5 medium, and of around 0.8 large (Cohen 1988).

Meta-analytic results

The estimate of the mean effect size of the association between OAS_P and academic performance was $d = 0.21$, indicating a small positive effect (see Table 2 for details). The sensitivity analysis showed that the estimates of between-study variance in study-average

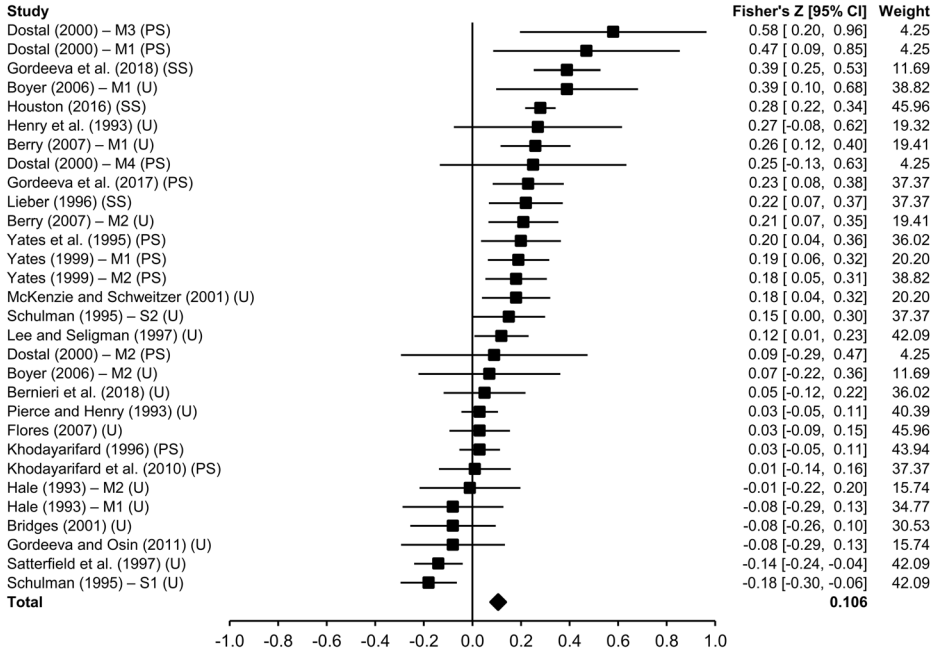

Fig. 1 Forest plot showing the 30 correlations (*r*-to-*z*-transformed) between OAS_P and academic achievement. The diamond on the bottom row represents the estimated in meta-regression effect size. For studies with multiple independent samples, the result for each sample (S1, S2, etc.) is reported separately. Similarly, for studies with multiple measures, the result for each measure (M1, M2, etc.) is reported separately. Letters in the brackets indicate the primary schoolchildren (PS), secondary schoolchildren (SS), or university students (U) sample

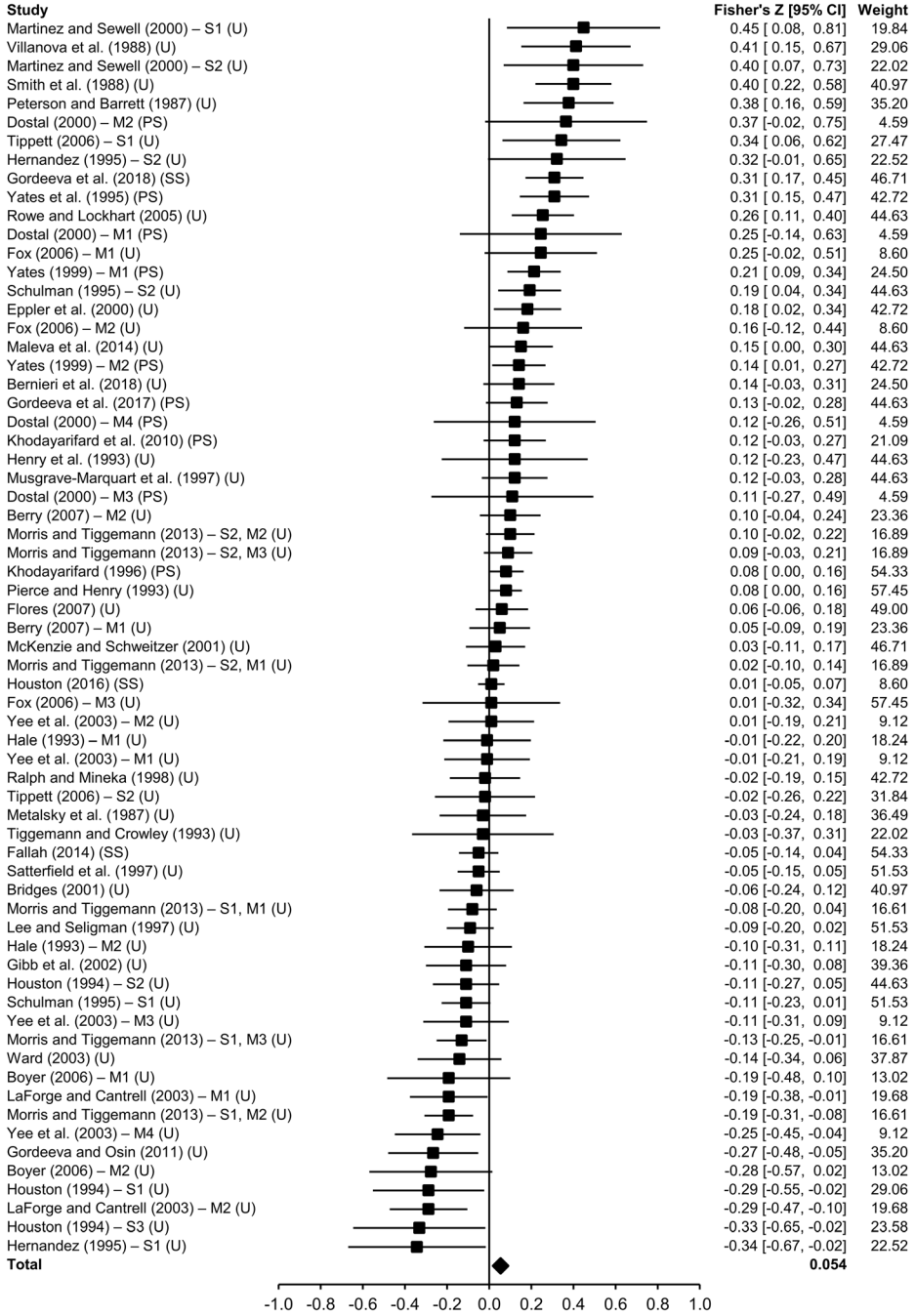

Fig. 2 Forest plot showing the 66 correlations (*r*-to-*z*-transformed) between OAS_N and academic achievement. The diamond on the bottom row represents the estimated in meta-regression effect size. For studies with multiple independent samples, the result for each sample (S1, S2, etc.) is reported separately. Similarly, for studies with multiple measures, the result for each measure (M1, M2, etc.) is reported separately. Letters in the brackets indicate the primary schoolchildren (PS), secondary schoolchildren (SS), or university students (U) sample

Table 2 Overall effect sizes and effect sizes by moderators

	Fisher's *z* (Cohen's *d*)					95% CI		Heterogeneity			
		SE	*t*	df	*P*	LL	UL	I^2	τ^2	*n*	*k*
Results for OAS_P ($N = 6.351$)											
Overall effect size	0.106 (0.21)	0.033	3.24	21.1	0.004	0.038	0.174	83.39	0.020	30	23
Moderator: Academic level											
Primary school	0.138 (0.28)	0.047	2.94	4.4	0.038	0.012	0.263	60.01	0.008	10	6
Secondary school	0.291 (0.59)	0.031	9.43	1.6	0.021	0.123	0.46	28.61	0.001	3	3
University	0.040 (0.08)	0.038	1.05	12.1	0.313	−0.043	0.123	74.35	0.013	17	14
Moderator: Type of test											
Achievement	0.270 (0.55)	0.016	16.84	1	0.038	0.066	0.473	0.00	0.000	3	2
General	0.088 (0.18)	0.034	2.58	18.9	0.018	0.017	0.159	77.91	0.016	27	21
Results for OAS_N ($N = 11.023$)											
Overall effect size	0.054 (0.11)	0.030	2.15	44.5	0.037	0.003	0.105	74.60	0.016	66	49
Moderator: Academic level											
Primary school	0.151 (0.30)	0.037	4.13	3.9	0.015	0.048	0.254	29.07	0.002	10	6
Secondary school	0.079 (0.16)	0.103	0.76	1.9	0.525	−0.369	0.527	89.62	0.018	3	3
University	0.034 (0.07)	0.030	1.14	36.7	0.263	−0.026	0.093	73.88	0.019	53	40
Moderator: Type of test											
Achievement	0.131 (0.26)	0.046	2.84	16.7	0.011	0.034	0.229	75.40	0.022	26	19
General	0.015 (0.03)	0.029	0.52	27.2	0.611	−0.045	0.075	74.11	0.015	40	30

N aggregate sample; *SE* standard error; *t* *t*-statistic; *df* Satterthwaite degrees of freedom (if the Satterthwaite degrees of freedom are less than 4, the probability of a Type I error is much higher than 0.05 and one should not trust the results); 95% *CI* 95% confidence interval; *LL* lower limit; *UL* upper limit; I^2 ratio of true heterogeneity to total variance across the observed effect sizes; τ^2 between-study variance in study-average effect sizes; *n* number of effect sizes; *k* number of independent samples; *Achievement* test contains achievement situations; *General* test contains general situations

effect sizes (τ^2) and, consequently, the estimate of the average effect size were robust to different values of within-study effect size correlation. The I^2 statistic ($I^2 = 83.39$, $\tau^2 = 0.020$) demonstrated a rather high level of heterogeneity in the effect sizes, indicating that the true effect of a given study could be substantially higher or lower than the meta-analytic average. We investigated the source of this heterogeneity through the moderator analyses reported next. For OAS_N, the estimate of the mean effect size was 0.11, indicating a weak but still significant effect. The sensitivity analysis showed that τ^2 and the average effect size were robust to different values of within-study effect size correlation. Again, the I^2 statistic ($I^2 = 74.6$, $\tau^2 = 0.016$) demonstrated a rather high level of heterogeneity in the effect sizes. We investigated the source of this heterogeneity through the moderator analyses reported next.

Additional analyses showed that the moderating effect of academic level was statistically significant for OAS_P (Wald test $F(5.30) = 14.07$, $p = 0.006$), indicating a tangible difference in the effects of OAS_P between primary and secondary schoolchildren and university students (see Table 3 for details). The effect of OAS_P in primary and secondary schoolchildren was moderate and significant ($d = 0.28$ and 0.59, respectively), while in university students this effect was insignificant and close to 0 ($d = 0.08$). The moderation effect of academic level on OAS_N was also significant (Wald test $F(6.02) = 5.74$, $p = 0.034$), and the analysis showed that there was moderate and significant effect of

Table 3 Moderator analysis results

						95% CI		Heterogeneity			
	Coeff	SE	*t*	df	*p*	LL	UL	I^2	τ^2	*n*	*k*
Results for OAS_P ($N = 6.351$)											
Moderator: Academic level (Wald test $F(5.30) = 14.07$, $p = 0.006$)								69.68	0.011		
Primary school (constant)	0.140	0.047	3.01	4.5	0.034	0.016	0.265			10	6
Secondary school	0.155	0.043	2.46	4.3	0.065	−0.015	0.326			3	3
University	−0.101	0.060	−1.68	8.5	0.130	−0.239	−0.037			17	14
Moderator: Type of test								76.88	0.015		
Achievement (constant)	0.258	0.021	12.1	1.0	0.053	−0.014	0.529			3	2
General	−0.171	0.040	−4.26	1.3	0.109	−0.494	0.153			27	21
Results for OAS_N ($N = 11.023$)											
Moderator: Academic level (Wald test $F(6.02) = 5.74$, $p = 0.034$)								73.80	0.017		
Primary school (constant)	0.163	0.036	4.59	4.6	0.007	0.070	0.257			10	6
Secondary school	−0.085	0.109	−0.78	4.5	0.474	−0.375	0.205			3	3
University	−0.130	0.046	−2.82	6.3	0.029	−0.242	−0.019			53	40
Moderator: Type of test								74.62	0.017		
Achievement (constant)	0.128	0.046	2.81	16.3	0.012	0.032	0.224			26	19
General	−0.114	0.054	−2.11	33.0	0.043	−0.224	−0.004			40	30

N aggregate sample; *Coeff* meta-regression estimate based on Fisher's *z*; *SE* standard error; *t* *t*-statistic; *df* Satterthwaite degrees of freedom (if the Satterthwaite degrees of freedom are less than 4, the probability of a Type I error is much higher than 0.05 and one should not trust the results); 95% *CI* 95% confidence interval; *LL* lower limit; *UL* upper limit; I^2 ratio of true heterogeneity to total variance across the observed effect sizes; τ^2 between-study variance in study-average effect sizes; *n* number of effect sizes; *k* number of independent samples; *Achievement* test contains achievement situations; *General* test contains general situations

OAS_N in primary schoolchildren ($d = 0.30$), but there were no significant effects in secondary schoolchildren (0.16) and university students (0.07).

Next, we divided all studies into two types according to the measure of OAS that was used. The first category included studies where OAS was measured using questionnaires containing only achievement situations—AASQ (Peterson and Barrett 1987) and EASQ (Houston 2016). The second category included studies that used a general measure of OAS (ASQ, Peterson et al. 1982, and CASQ, Thompson et al. 1998) composed from both achievement and interpersonal situations. We discovered that the effect of the OAS_N on academic achievement was tangible and statistically significant when AS was measured using tests based on achievement situations ($d = 0.26$), while it was significantly weaker for studies with general AS measures ($d = 0.03$). The effect size of OAS_P was also much higher for the tests based on achievement situations ($d = 0.55$ vs $d = 0.18$), but there were only two studies with three effects for the analysis in this category so estimation of significance was impossible.

We also performed an additional meta-analysis on the studies reporting simultaneous effects of OAS_N and OAS_P. This analysis is relevant because such simultaneous regressions remove the common variance of OAS_P and OAS_N and show their unique relationships with the outcome. Twenty-two such studies were found ($k = 29$, $N = 6182$). The results of the meta-analysis showed a significant positive effect of OAS_P ($d = 0.20$, $B = 0.101$, SE = 0.034, $t(20) = 2.98$, $p = 0.007$, 95% CI [0.030, 0.171], $I^2 = 83.85$, $\tau^2 = 0.02$) and a non-significant positive effect of OAS_N ($d = 0.11$, $B = 0.056$, SE = 0.029, $t(19) = 1.94$, $p = 0.067$, 95% CI [−0.004, 0.116], $I^2 = 70.66$, $\tau^2 = 0.01$). All the estimates

of effect sizes and τ^2 in this additional meta-analysis were also quite stable across varying values of the in-study effect size correlation (ρ). Thus, the results of this more rigorous comparison were analogous to the results based on the full sample of studies, although the very weak effects of OAS_N became insignificant as a result of diminished sample size.

Present studies

The meta-analysis described above supported the initial conclusions of the informal literature review which began this article. Specifically, OAS_P was a reliable predictor of academic achievement, and OAS_N was less so. The results for OAS_N do not fully corroborate the findings of a previous meta-analysis of Richardson et al. (2012), which showed that OAS_N is not related to academic achievement ($k = 8$, $r = 0.01$, 95% CI [− 0.12, 0.13]). However, they reported data on university students only, and the number of studies was much smaller. Also, we found good evidence that within schoolchildren there is a significant relation between OAS_N and academic performance.

Thus, apparently, one type of optimistic attributional style is more helpful for promoting academic achievement: the type which views positive outcomes as being due to stable, global, and internal factors. As discussed earlier, such beliefs may help people maintain motivation, expect success, cope with failure, make plans, and hold themselves accountable for results. Given the likelihood that academic successes really do reflect effortful striving by the student, OAS_P may also serve to positively reinforce academic striving, and serve to cognitively link past expenditures of effort with expectancies of future success and expanding life-implications.

The principal limitation of the meta-analysis pertains to the relatively small number of studies that directly compared OAS_P and OAS_N (see Table 4). A second limitation is that a comparison of the effects of OAS_P for the two types of test (general vs domain-specific) was impossible, since most of the research was carried out using the general ASQ. Information on the role of achievement situations could be derived from two studies only with three effects, and these results show that OAS_P is strongly related to GPA if the test is domain-specific. A third limitation is that the existing studies are unevenly distributed across different levels of moderators, so that in the group of schoolchildren and achievement tests, there was only one study (see Table 4 for details). Thus, we planned two new studies. One of them allowed us to analyze the role of type of test in a schoolchildren sample, and the other allowed us to analyze the role of positive achievement situations in a university student sample. In cross-sectional

Table 4 Number of effects for each level of moderators in meta-analysis

Academic level	OAS_P, type of measure		OAS_N, type of measure	
	A	G	A	G
Primary school	0	10	0	10
Secondary school	1	2	1	2
University students	2	15	25	28

A ASQ measure contains achievement situations only; *G* ASQ measure contains general situations

Study 1 and longitudinal Study 2, we endeavored to newly test the conclusions derived from the meta-analysis, by measuring both types of attributional style using samples of two academic levels—high school children and university students. We also used both types of ASQ—general and achievement-specific.

Our specific research hypotheses for the two empirical studies were as follows: (1) OAS_P would have a stronger effect on academic achievement than OAS_N; (2) the effect of OAS on achievement would be stronger for schoolchildren, than for university students; and (3) type of questionnaire (general vs achievement-specific) would be also important: the effect will be more pronounced for questionnaires worded in terms of achievement situations.

Previous research on attributional style has faced some methodological problems regarding the dimensions of OAS (Peterson 1991), which has led to some unreliable results. In our research, we focused only on the stability and globality dimensions of attributional style, as recommended by Abramson et al. (1989) and Seligman (2002; see also Houston 1994). This is because the locus dimension has been shown to be problematic at a methodological level (i.e., low reliability, Cutrona et al. 1984; Smith et al. 2013; Xenikou et al. 1997), as well as at a conceptual level (i.e., questionable construct validity, Travers et al. 2015).

Study 1

Method

Participants and procedure

Participants were 202 10th and 11th graders drawn from five regular secondary schools located in Moscow. The sample comprised 74 boys and 128 girls; *M* age = 15.37, SD = 1.02, age range 14–18 years. The paper-and-pencil survey batteries were administered to students in group settings during regular class hours. The research was introduced as "a study of adolescents' views on life." Parental consent as well as students' own consent to participate was obtained for all students.

Measures

Attributional style A version of the ASQ modified for adolescents (Peterson et al. 1982) was used (SFASQ, see Gordeeva et al. 2009; Osin et al. 2013, for reliability and validity information). The measure was comprised of 24 hypothetical life scenarios, including academic, sport, and interpersonal. An example situation is: "You have successfully passed an important exam." After having written down the likely cause of this situation, the respondent assessed it using these items: "The cause of my successfully passing the important exam… will never re-emerge / will exist forever" (unstable-stable dimension) and "This cause is associated… with only this situation / with every situation in my life" (specific-global dimension). As in the original ASQ, participants were instructed to imagine that each situation had actually happened to them, and to write down the most likely cause. OAS_P was the sum of the stable and global ratings across the 15 positive event situations (Cronbach's $\alpha = 0.77$), and

OAS_N was the sum of the unstable and local (after recoding) ratings of the 9 negative event situations (Cronbach's $\alpha = 0.84$). Also as described below, in our confirmatory analyses, we modeled both the positive/negative dimension and the globality and stability dimensions.

Academic achievement In addition to completing the questionnaires, students were asked to indicate their last term's grades in three principal school subjects (Math, Native Language, and Literature). The three grades were averaged to form an overall academic achievement indicator (Cronbach's $\alpha = 0.79$).

Method of analyses

To analyze the factor structure of our ASQ, following Liu and Bates (2014), we used a CFA, testing a hierarchical model consisting of two second-order factors (OAS_P and OAS_N) and four first-order factors (positive-stable, positive-global, negative-stable, negative-global). Twelve parcels were used as indicators of these factors (3 parcels per each factor; the distribution of items between the parcels was random, Bandalos and Finney 2001). Each second-order factor was defined by two first-order factors (stable and global), with the loadings of the first-order factors set equal to each other to achieve convergence. Modeling was undertaken using Mplus 7.4 (Muthén and Muthén 2015). Further analysis including descriptive statistics, correlations, and regression analysis was carried out using the computing platform R (R Core Team 2018).

Results

Confirmatory analyses

Analysis of the factor structure of the ASQ showed that the covariance between the second-order factors (OAS_P and OAS_N) was not significant and was deleted from the model. Estimation of the resulting factor model yielded a satisfactory fit: MLR, $\chi^2 = 85.49$; df = 52; $p = 0.002$; CFI = 0.942; NNFI = 0.927; RMSEA = 0.056; 90% CI for RMSEA 0.034–0.077; PCLOSE = 0.293; $N = 202$. All paths were significant at $p < 0.01$. The hierarchical model with one second-order factor (OAS) showed lack of fit: $\chi^2 = 154.56$; df = 51; $p < 0.001$; CFI = 0.822; NNFI = 0.769; RMSEA = 0.100; 90% CI for RMSEA 0.082–0.119; PCLOSE = 0.000; $N = 202$.

Table 5 Study 1: mean scores, reliability coefficients, and Pearson correlations for attributional style and academic performance (high school students, $n = 202$)

Scale	*M*	SD	α	OAS_P	OAS_N
OAS_P	8.14	1.70	0.77	–	
OAS_N	8.89	1.36	0.84	0.05	–
GPA	3.66	0.53	0.79	0.25***	0.09

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 6 Study 1: Pearson correlations for general attributional style, academic attributional style and academic performance (high school students, $N = 202$)

Subject/ indicator	OAS_P (positive-composite)	OAS_N (negative-composite)	*p*-diff.	OAS_P (5 acad. events)	OAS_N (4 acad. events)	*p*-diff.
Native Lang.	0.24***	0.04	0.021	0.27***	0.13	0.072
Literature	0.18**	0.02	0.053	0.21**	0.10	0.130
Algebra	0.19**	0.12	0.237	0.26***	0.17*	0.173
Geometry	0.21**	0.11	0.153	0.25***	0.15*	0.149
GPA	0.25***	0.09	0.050	0.30***	0.17*	0.085
Cronbach's α	0.77	0.84		0.73	0.68	

Lang. Language, *p-diff.* *p* value (one-tailed) for difference between two correlations

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Substantive analyses

Table 5 presents descriptive statistics and correlations for the major study variables. *T*-tests conducted upon the five study variables revealed that girls earned a significantly higher GPA than boys; however, gender did not moderate any of the results below, so it is not considered further. At the zero-order level, only OAS_P showed a significant correlation with academic performance. The same results were obtained in multiple regression analysis using OAS_P and OAS_N as predictors of GPA. Standardized coefficient beta was significant for OAS_P (beta = 0.25, $p < 0.001$), but not significant for OAS_N (beta = 0.07, $p = 0.29$).

During further analysis, we divided the scenarios in SFASQ into two types: achievement and general events. For each type of scenario, the sum score was calculated (but negative events estimates were inverted before scoring). Further, scores by academic achievement events were calculated separately for negative ($N = 4$) and positive ($N = 5$) events. In this case, both OAS_P and OAS_N showed significant associations with GPA (see Table 6), although again as shown in the meta-analysis, the correlation of OAS_P with academic performance was stronger and more significant but the difference between these correlations was not significant. In particular, the correlations presented in Table 6 show that the OAS_P score was significantly associated with grades for every single subject and cumulative GPA both in case of the general OAS and academic OAS, although the correlations were slightly stronger in the case of academic-specific OAS.

Study 2

In Study 2, we assessed college students, in whom much weaker relationships were observed between both types of OAS and GPA, in our meta-analysis. However, most previous studies with this group used either a general ASQ or an academic ASQ (AASQ, Peterson and Barrett 1987) that measures only OAS_N. In our study, we used the extended AASQ which allowed us to measure both OAS_P and OAS_N. Also, Study 2 employed a longitudinal design, to evaluate the effects of initial OAS_P and

OAS_N upon changes in academic achievement, measured prior the study (Time 0), simultaneously with OAS at Time 1, and at a later Time 2. Showing such effects would strengthen the case for causal nature of relationships between OAS and academic performance, showing that the disposition to optimistically explain positive events can help a person improve upon their own achievement levels.

Method

Participants and procedure

Initial participants were 151 university freshmen from Moscow State University, 83 males and 68 females; *M* age = 17.69; SD = 0.96, age range 16–26 years. Participants completed the modified AASQ in the spring of their freshman year (T1). To control base level of achievement, we used prior GPA for autumn session (T0). The longitudinal effect on achievement was estimated using the next year GPA for autumn session (T2). Nine participants left the university during the study, but attrition analyses comparing means between the subsamples with full and missing data revealed no significant differences, indicating that participants were missing at random. The questionnaires were administered to students in group settings during class. The research was introduced as "a study of youths' views on life."

Measures

Attributional style To measure attributional style, the SFASQ for university students was used, which included only achievement situations. Specifically, the measure comprised 12 hypothetical scenarios related to students' academic events, with 5 positive and 7 negative situations. The scenarios were all within the achievement domain, befitting our primary focus on academic achievement as an outcome. As before, participants were instructed to imagine that a situation actually happened to them and to report the most likely cause. Then, using a 6-point Likert scale, participants rated the cause on two main dimensions of attributional style: stable-unstable and global-specific. Again, the internality parameter was not used due to the methodological and conceptual reasons (and recommendations) described above. An OAS_P score was computed by summing the stable and global ratings for positive situations (Cronbach's $\alpha = 0.80$), and an OAS_N score was computed by first reversing the ratings of the negative situations, then summing the two kinds of ratings (Cronbach's $\alpha = 0.89$).

Academic achievement The actual academic performance of undergraduate students was measured using average grades for end-of-term examinations (usually 4 exams), which take place twice a year (Fall and Spring semesters). We used an average score for session 1, which was previous to measurement of OAS time (T0) and prospective to the measurement time session 2 (T1) and session 3 (T2).

Method of analyses

We used CFA to test a hierarchical model of the SFASQ with two second-order factors (OAS_P and OAS_N) and four first-order factors (positive-stable, positive-global, negative-stable, negative-global), allowing correlations within each pair of items referring to the same

situation. Each second-order factor was again defined by two first-order factors (stable and global factors), with the loadings of the first-order factors set equal to each other in order to achieve convergence. Also, we used structural equation modeling to test longitudinal effects of OAS_P and OAS_N on students' academic achievement controlling for prior level of their GPA. As in Study 1, a full-information maximum likelihood method (Enders and Bandalos 2001) was used to analyze missing data. CFA and structural modeling was undertaken using Mplus 7.4 (Muthén and Muthén 2015). Descriptive statistics and correlations were estimated in the computing platform R (R Core Team 2018).

Results

Confirmatory analyses

Analysis of the factor structure of the SFASQ showed that the covariance between the second-order factors (OAS_P and OAS_N) was non-significant so it was deleted from model. Estimation of this model yielded a good fit: MLR, $\chi^2 = 314.35$; df = 238; $p < 0.001$; CFI = 0.933; TLI = 0.922; RMSEA = 0.046, 90% CI for RMSEA 0.031–0.059, PCLOSE = 0.672, $N = 151$. All paths were significant at $p < 0.01$. A hierarchical model with only one second-order factor showed worse fit: $\chi^2 = 349.28$; df = 235; $p < 0.001$; CFI = 0.899; NNFI = 0.882; RMSEA = 0.057; 90% CI for RMSEA 0.044–0.069; PCLOSE = 0.185; $N = 151$.

Substantive analyses

Table 7 presents descriptive statistics and correlations for the major study variables. *T*-tests conducted upon the five study variables revealed that again women earned a significantly higher GPA at the end of the year than men; however, gender did not moderate any of the results below, so it is not considered further.

The model of longitudinal effects of OAS_P and OAS_N on students' academic achievement fits the data very well: MLR, $\chi^2 = 3.790$; df = 3; $p = 0.285$; CFI = 0.996; NNFI = 0.990; RMSEA = 0.042; 90% CI for RMSEA 0.000–0.149; PCLOSE = 0.440; $N = 151$. As can be seen in Fig. 3, the cross-sectional effects were not significant: OAS_P and OAS_N were not associated with concurrent GPA (T1). Turning to the longitudinal part of the model, OAS_P significantly predicted GPA at T2 controlling for GPA at T1 and T0, indicating that OAS_P predicts *change* in GPA. So, having a strong OAS_P at T1 may help people improve their achievement levels at a later time, compared to their own initial baselines.

Table 7 Study 2: Mean scores, reliability coefficients, and Pearson correlations for attributional style and academic performance (university students sample)

Indicator	*N*	*M*	SD	α	OAS_P	OAS_N	T0 GPA	T1 GPA
OAS_P	151	9.24	1.53	0.80	–			
OAS_N	151	7.63	1.94	0.89	−0.11	–		
T0 GPA	151	4.21	0.57	–	0.11	−0.04	–	
T1 GPA	151	4.30	0.57	–	0.16	−0.01	0.72***	–
T2 GPA	142	4.07	0.80	–	0.24*	−0.01	0.67***	0.80***

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

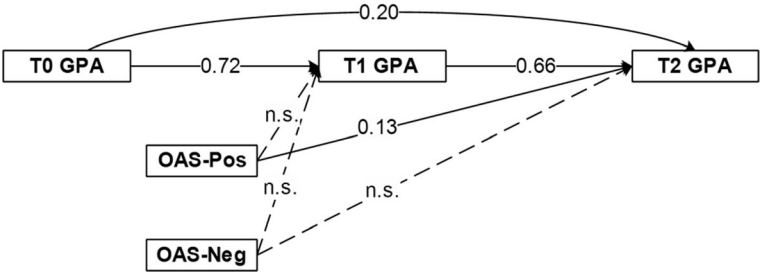

Fig. 3 Study 2: Path model showing longitudinal relationships between OAS_P and OAS_N and academic achievement (all coefficients are standardized, dashed lines represent insignificant paths, other paths are significant at $p < 0.05$). $\chi^2 = 3.790$; df = 3; $p = 0.285$; CFI = 0.996; NNFI = 0.990; RMSEA = 0.042; 90% CI for RMSEA 0.000–0.149; PCLOSE = 0.440; $N = 151$

General discussion

In our meta-analysis and two new studies, we re-examined some lingering issues in the literature linking attributional style and academic performance. We have shown that the way students explain the *good* things that happen to them may ultimately be more important for their achievement than how they explain the *bad* things that happen to them. These results are generally in line with positive psychology theories and research showing asymmetries of positive and negative emotions (Fredrickson 2001; Bryant and Veroff 2007). This result also echoes findings showing that OAS for explaining positive events is more important for daily life satisfaction and relationship well-being than is OAS for explaining negative events (Gable et al. 2004).

In our two new studies, we were able to demonstrate a clear two-factor structure in the ASQ. According to these analyses, ASQ data are primarily characterized by a distinction between the *type* of event being explained: negative or positive. Also, both our studies found that within each type of event, globality and stability factors can also be found: the two major dimensions of attributions typically employed by attributional style researchers. We suggest that for many, if not most, purposes, these two dimensions of attributional style can be collapsed together to create OAS_P and OAS_N scores, given that they are associated at approximately $r = 0.50$. However, in some cases, researchers may want to examine the separate effects of globality and stability. We ourselves did not find consistent-enough effects, in this regard, to be worth reporting.

In both our studies, OAS_P predicted academic achievement, and OAS_N did not, in line with the general results of our meta-analysis. Furthermore, the pattern was shown in longitudinal as well as cross-sectional data, indicating that OAS_P is not just a disposition that develops *after* students begin performing well. Instead, an initially high OAS_P score can help students to do even better than they have been doing. We suggest that a propensity to explain good outcomes as due to factors that will last, and that will spread to other areas of one's life, helps students stay intrinsically motivated, set achievable goals, and persist in the face of minor setbacks that occur. Such a propensity can also help people savor and capitalize on their minor successes, using them as positive emotional springboards for the expansion of self-efficacy (Bandura 1997) and the "broadening and building" of cognitive resources (Fredrickson 2001).

We have also shown that the type of ASQ measure (domain-specific vs domain-general) matters: optimism measured specifically for academic outcomes predicts academic performance, whereas domain-general ASQ is less related to GPA. This result is generally in line with Bandura's self-efficacy theory (Bandura 1997), showing that domain-specific efficacy beliefs better predict academic performance than domain-general efficacy beliefs. However, further research is needed to confirm this, because in the meta-analysis, we found fewer studies that tested the domain-specific effect, especially domain-specific regarding attributions for positive events.

Why was OAS_N a weaker predictor of academic achievement than OAS_P? Seemingly, the ability to perceive academic failures as being caused by local/unstable factors should help students cope with distress and re-focus their energies. As alluded to earlier, however, OAS_N may instead reflect a short-term or emotion-focused coping style, designed to deflect bad feelings in the present. However at times, this may blind strivers to actual problems that need to be resolved, making OAS_N problematic for actual achievement.

Why were both OAS_P and OAS_N more related to academic performance in schoolchildren than in university students, as found in our meta-analysis and our two new studies? One possibility involves the fact that academic performance is assessed differently at the university level than at the school level (Poropat 2009; Erickson 2011). Specifically, at the school level, interactions between students and teachers are more immediate and direct, such that students can affect their own grades by affecting teachers' interpersonal evaluations of them. Another interpretation of the current findings is that traditionally educators in secondary and high schools tend to assess students on behavioral and personality (character) factors, not separating them from measures of students' performance. Conversely, student–professor relationships are much more distant, removing interpersonal evaluations from the equation.

The current findings have a number of practical implications. Most importantly, they suggest that attributional retraining within the academic context should especially focus on students' explanations for positive events. Rather than teaching students how *not* to "catastrophize" when things go wrong, it may be more important to teach them to *celebrate* when things go right—or more specifically, to teach them to recognize when stable and global aspects of their own personality and life-strategies have caused good things to happen. Indeed, these results could extend the Penn resilience program (Gillham et al. 1995) which show that OAS_N can be actively cultivated, giving young people the tools to protect against depression and achieve long-lasting success within ever-wider and broader spheres of life. Learning to cultivate OAS_P within oneself may serve to further reinforce and support those characteristics, causing an "upward spiral" of self-reinforcing activity (Sheldon and Houser-Marko 2001).

Limitations and future directions

We did not study the mechanisms that link OAS_P and OAS_N with academic achievement, such as academic goals, coping strategies, self-efficacy, and persistence. Furthermore, the causal relation between attributional style and academic achievement still requires further evidence. Although our Study 2 was longitudinal and controlled for baseline achievement, it lasted only a year, and used only university students. It will be important to replicate these results with middle school and high school students, also using domain-specific ASQs.

Another limitation is the absence of achievement data within domains other than academic. That is, the generalizability of the achievement findings to the domains of work, sport, or recreation remains to be demonstrated in future studies.

Conclusions

Many studies have shown that optimistic attributional style is positively related to well-being (Sweeney et al. 1986). However, attempts to extend the role of OAS to achievement have yielded unclear results. Our meta-analysis and two new studies found that OAS_P is more strongly associated with academic performance than OAS_N. We also found that the participant's academic level (primary school/secondary school/university) and the type of ASQ test (domain-specific/general) moderated associations with academic performance. Our findings thus highlight the importance of encouraging students to think optimistically not only regarding failures but also regarding successes they experience.

Acknowledgments The article was prepared within the framework of the HSE University Basic Research Program and funded by the Russian Academic Excellence Project '5-100' (Study 1 and 2) and also supported by the Russian Foundation for Basic Research, project # 16-36-0037 (meta-analysis).

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

*denotes studies included in the meta-analysis

Abramson, L. Y., Seligman, M. E. P., & Teasdale, J. D. (1978). Learned helplessness in humans. *Journal of Abnormal Psychology, 87*(1), 49–74. https://doi.org/10.1037/0021-843X.87.L49.

Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: a theory-based subtype of depression. *Psychological Review, 96*(*2*), 358–372. https://doi.org/10.1037/0033-295X.96.2358.

Bandalos, D. L., & Finney, S. J. (2001). Item parceling issues in structural equation modeling. In G. A. Marcoulides & R. Schumacker (Eds.), *New developments & techniques in structural equation modeling* (pp. 269–296). Mahwah: Lawrence Erlbaum.

Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: Freeman.

*Bernieri, F., Fultz, A.A., & Brown, J. A. (2018). *Attributional style and self-reported high school and college grade point average*. Oregon State University. Unpublished data.

*Berry, S. R. (2007). *An exploration of defensive pessimism, explanatory style, and expectations in relation to the academic performance of college and university students* (Doctoral Dissertation). Louisville: University of Louisville. https://doi.org/10.18297/etd/104.

*Boyer, W. (2006). Accentuate the positive: the relationship between positive explanatory style and academic achievement of prospective elementary teachers. *Journal of Research in Childhood Education, 21*(1), 53–63. https://doi.org/10.1080/02568540609594578.

*Bridges, K. R. (2001). Using attributional style to predict academic performance: how does it compare to traditional methods? *Personality and Individual Differences, 31* (5), 723–730. https://doi.org/10.1016/S0191-8869(00)00174-4.

Bryant, F. B., & Veroff, J. (2007). *Savoring: a new model of positive experience*. Mahwah: Lawrence Erlbaum.

Chamorro-Premuzic, T., & Furnham, A. (2006). Intellectual competence and the intelligent personality: a third way in differential psychology. *Review of General Psychology, 10*(3), 251–267.

Cheng, H., & Furnham, A. (2001). Attributional style and personality as predictors of happiness and mental health. *Journal of Happiness Studies, 2*(3), 307–323. https://doi.org/10.1023/A:1011824616061.

Cheng, H., & Furnham, A. (2003). Attributional style and self-esteem as predictors of psychological well-being. *Counseling Psychology Quarterly, 16*(2), 121–130. https://doi.org/10.1080/0951507031000151516.

Ciarrochi, J., Heaven, P. C., & Davies, F. (2007). The impact of hope, self-esteem, and attributional style on adolescents' school grades and emotional well-being: a longitudinal study. *Journal of Research in Personality, 41*(6), 1161–1178. https://doi.org/10.1016/j.jrp.2007.02.001.

Cohen, J. (1988). *Statistical power analysis of the behavioral sciences* (2nd ed.). New York: Academic Press.

Cutrona, C. E., Russell, D., & Jones, R. D. (1984). Cross-situational consistence in causal attributions: Does attributional style exist? *Journal of Personality and Social Psychology, 47*(5), 1043–1058. https://doi.org/10.1037/0022-3514.47.5.1043.

Dosedlová, J., Klimusová, H., Burešová, I., Jelínek, M., Slezáčková, A., & Vašina, L. (2015). Optimism and health-related behaviour in Czech university students and adults. *Procedia-Social and Behavioral Sciences, 171*, 1051–1059. https://doi.org/10.1016/j.sbspro.2015.01.278.

*Dostal, P. (2000). *An examination of explanatory style and habits of the mind as correlates of academic achievement in 7th-grade gifted students* (Master's thesis). In Long Beach: California State University.

Dykema, J., Bergbower, K., Doctora, J. D., & Peterson, C. (1996). An attributional style questionnaire for general use. *Journal of Psychoeducational Assessment, 14*(2), 100–108. https://doi.org/10.1177/073428299601400201.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling, 8*(3), 430–457. https://doi.org/10.1207/S15328007SEM0803_5.

*Eppler, M. A., Carsen-Plentl, C., & Harju, B. L. (2000). Achievement goals, failure attributions, and academic performance in nontraditional and traditional college students. *Journal of Social Behavior and Personality, 15(3),* 353–372.

Erickson, J. A. (2011). A call to action: transforming grading practices. *Principal Leadership, 11*(6), 42–46.

*Fallah, N. (2014). *Familial, academic, and interpersonal predictors of attributional style in Latino youth* (Doctoral Dissertation). Greensboro: The University of North Carolina.

Fisher, Z., & Tipton, E. (2015). *Robumeta: an R-package for robust variance estimation in meta-analysis* (arXiv preprint, arXiv:1503.02220).

*Flores, A. (2007). *Attributional style, self-efficacy, and stress as predictors of academic success and academic satisfaction in college students* (Doctoral Dissertation). Salt Lake City: University of Utah.

*Fox, L. A. (2006). *An exploration of the relationship of explanatory style to academic achievement, college student persistence, ACT/SAT composite scores, and college student inventory measures* (Master's dissertation). Montana State University-Bozeman, College of Agriculture.

Fredrickson, B. L. (2009). *Positivity*. New York: Three Rivers Press.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American psychologist, 56*(3), 218–226. https://doi.org/10.1037/0003-066X.56.3.218.

Gable, S. L., Reis, H. T., Impett, E. A., & Asher, E. R. (2004). What do you do when things go right? The intrapersonal and interpersonal benefits of sharing positive events. *Journal of Personality and Social Psychology, 87*(2), 228–245. https://doi.org/10.1037/0022-3514.87.2.228.

*Gibb, B. E., Zhu, L., Alloy, L. B., & Abramson, L. Y. (2002). Attributional styles and academic achievement in university students: a longitudinal investigation. *Cognitive Therapy and Research, 26*(3), 309–315. doi: https://doi.org/10.1023/A:1016072810255.

Gillham, J. E., Reivich, K. J., Jaycox, L. H., & Seligman, M. E. P. (1995). Prevention of depressive symptoms in schoolchildren: two-year follow-up. *Psychological Science, 6*(6), 343–351.

*Gordeeva T.O., Lunkina M.V., Sychev O.A. (2018). Sources of optimistic thinking and well-being of adolescents. *Voprosy Psykhologii*, *5*, 13–32.

*Gordeeva T.O., Osin E.N. (2011). Optimistic attributional style as a predictor of well-being and performance in different academic settings: A new look at the problem. In I. Brdar (Ed.), *The Human Pursuit of Well-Being: A Cultural Approach*. Springer Dordrecht (pp. 159–174). doi: https://doi.org/10.1007/978-94-007-1375-8_14.

Gordeeva, T. O., Osin, E. N., & Shevyakhova, V. Y. (2009). *Measurement of optimism as attributional style for negative and positive life events: Success and Failure Attributional Style Questionnaires for adults and adolescents* (Vol. 152). Moscow: Smysl.

*Gordeeva T. O., Sychev O. A., Osin E. N. (2017). Diagnostics of optimism: children's questionnaire of optimistic attributional style of successes and failures. *Cultural-historical psychology, 13*(2), 50–60. doi: https://doi.org/10.17759/chp.2017130206.

*Hale, B. D. (1993). Explanatory style as a predictor of academic and athletic achievement in college athletes. *Journal of Sport Behavior, 16*(2), 63–75.

Hedges, L. V., Tipton, E., & Johnson, M. C. (2010). Robust variance estimation in meta-regression with dependent effect size estimates. *Research Synthesis Methods, 1*(1), 39–65. https://doi.org/10.1002/jrsm.5.

*Henry, J. W., Martinko, M. J., & Pierce, M. A. (1993). Attributional style as a predictor of success in a first computer science course. *Computers in Human Behavior, 9*(4), 341–352. https://doi.org/10.1016/0747-5632(93)90027-P.

*Hernandez, M. (1995). *The relationship of cultural and class variables to attributional* style *and academic performance among college students* (Doctoral dissertation). Stillwater: Oklahoma State University.

Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *British Medical Journal, 327*, 557–560. https://doi.org/10.1136/bmj.327.7414.557.

Hilsman, R., & Garber, J. (1995). A test of the cognitive diathesis-stress model of depression in children: academic stressors, attributional style, perceived competence, and control. *Journal of Personality and Social Psychology, 69*(2), 370–380. https://doi.org/10.1037/0022-3514.69.2.370.

*Houston, D. M. (1994). Gloomy but smarter: the academic consequences of attributional style. *British Journal of Social Psychology,* 33(4), 433–441. https://doi.org/10.1111/j.2044-8309.1994.tb01039.x.

*Houston, D. M. (2016). Revisiting the relationship between attributional style and academic performance. *Journal of Applied Social Psychology, 46(3*), 192–200. https://doi.org/10.1111/jasp.12356.

Hu, T., Zhang, D., & Yang, Z. (2015). The relationship between attributional style for negative outcomes and depression: a meta-analysis. *Journal of Social and Clinical Psychology, 34*(4), 304–321. https://doi.org/10.1521/jscp.2015.34.4.304.

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: correcting error and bias in research findings*. Thousand Oaks: Sage.

Jackson, B., Sellers, R. M., & Peterson, C. (2002). Pessimistic explanatory style moderates the effect of stress on physical illness. *Personality and Individual Differences, 32*(3), 567–573. https://doi.org/10.1016/S0191-8869(01)00061-7.

Jensen, A. R. (1980). *Bias in mental testing*. New York: Free Press.

Kent, R. L., & Martinko, M. J. (1995). The measurement of attributions in organizational research. In M. J. Martinko (Ed.), *Attribution theory: an organizational perspective* (pp. 17–75). Delray Beach: St. Lucie Press.

*Khodayarifard, M. (1996). *Students' and their parents' attributional style, trait anxiety, and socio-demographic factors as predictors of teachers' perceptions of a academic performance in late childhood* (Doctoral dissertation). Wollongong: University of Wollongong.

*Khodayarifard, M., Brinthaupt, T. M., & Anshel, M. H. (2010). Relationships of parents' and child's general attributional styles to academic performance. *Social Psychology of Education, 13*(3), 351–365. doi: https://doi.org/10.1007/s11218-010-9114-2.

*LaForge, M. C., & Cantrell, S. (2003). Explanatory style and academic performance among college students beginning a major course of study. *Psychological Reports,* 92(3), 861–865. https://doi.org/10.2466/pr0.2003.92.3.861.

*Lee, Y.-T., & Seligman, M. E. P. (1997). Are Americans more optimistic than the Chinese? *Personality and Social Psychology Bulletin, 23(1),* 32–40. https://doi.org/10.1177/0146167297231004.

Leeson, P., Ciarrochi, J., & Heaven, P. (2008). Cognitive ability, personality, and academic performance in adolescence. *Personality and Individual Differences, 45*(7), 630–635. https://doi.org/10.1016/j.paid.2008.07.006.

*Lieber, E. (1996). *The Teenage Attributional Style Questionnaire (TASQ): a valence and dimension-sensitive methodology for exploring attributional style in adolescent populations* (Doctoral dissertation). Urbana-Champaign: University of Illinois at Urbana-Champaign.

Liu, C., & Bates, T. C. (2014). The structure of attributional style: Cognitive styles and optimism–pessimism bias in the Attributional Style Questionnaire. *Personality and Individual Differences, 66*, 79–85. https://doi.org/10.1016/j.paid.2014.03.022.

Lynd-Stevenson, R. M., & Rigano, L. M. (1996). Threat expectancy mediates the relationship between attributional style for negative outcomes and anxiety. *Cognitive Therapy Research, 20*(6), 637–651. https://doi.org/10.1007/BF02227966.

*Maleva, V., Westcott, K., McKellop, M., McLaughlin, R., & Widman, D. (2014). Optimism and college grades: predicting GPA from explanatory style. *Psi Chi Journal of Psychological Research, 19*(3), 129–135.

*Martinez, R., & Sewell, K. W. (2000). Explanatory style as a predictor of college performance in students with physical disabilities. *Journal of Rehabilitation, 66*(1), 30–36.

*McKenzie, K., & Schweitzer, R. (2001). Who succeeds at university? Factors predicting academic performance in first year Australian university students. *Higher Education Research & Development, 20*(1), 21–33. doi: https://doi.org/10.1080/07924360120043621.

*Metalsky, G. I., Halberstadt, L. J., & Abramson, L. Y. (1987). Vulnerability to depressive mood reactions: toward a more powerful test of the diathesis-stress and causal mediation components of the reformulated theory of depression. *Journal of Personality and Social Psychology, 52*(2), 386–393.

*Morris, M., & Tiggerman, M. (2013). The impact of attributions on academic performance: a test of the reformulated learned helplessness model. *Social Sciences Directory, 2*(2), 3–15. https://doi.org/10.7563/SSD_02_02_01.

*Musgrave-Marquart, D., Bromley, S. P., & Dalley, M. B. (1997). Personality, academic attribution, and substance use as predictors of academic achievement in college students. *Journal of Social Behavior and Personality, 12*(2), 501–511.

Muthen, L. K., & Muthen, B. (2015). Mplus. *The comprehensive modeling program for applied researchers: user's guide,* 5.

Needles, D. J., & Abramson, L. Y. (1990). Positive life events, attributional style, and hopefulness: testing a model of recovery from depression. *Journal of Abnormal Psychology, 99*(2), 156–165.

Olejnik, S., & Algina, J. (2000). Measures of effect sizes for comparative studies: applications, interpretations, and limitations. *Contemporary Educational Psychology, 25*(3), 241–286. https://doi.org/10.1006/ceps.2000.1040.

Osin E.N., Gordeeva T.O., & Sychev O.A. (2013). Attributional Style as a Complex Construct: The Role of Perceived Control. In I. Alonso-Arbiol & K. Diez (Eds.), *12th European Conference on Psychological Assessment, July 17–20, 2013:* Book of abstracts (pp. 245). San Sebastian: Fotocopias Zorroaga, S.L. Retrieved from http://www.ehu.eus/gip/publicaciones/congresos/2013/ECPA_donostia_(programa).pdf. Accessed 3 March 2018.

Perry, R. P., Stupnisky, R. H., Daniels, L. M., & Haynes, T. L. (2008). Attributional (explanatory) thinking about failure in new achievement settings. *European Journal of Psychology of Education, 23*(4), 459–475.

Peterson, C. (1991). The meaning and measurement of explanatory style. *Psychological Inquiry, 2*(1), 1–10. https://doi.org/10.1207/s15327965pli0201_1.

Peterson, C. (1995). Explanatory style and health. In G. McClelland Buchanan & M. E. P. Seligman (Eds.), *Explanatory style* (pp. 233–246). Hillsdale: Lawrence Erlbaum Associates.

*Peterson, C., & Barrett, L. (1987). Explanatory style and academic performance among university freshmen. *Journal of Personality and Social Psychology, 53*(3), 603–607. https://doi.org/10.1037/0022-3514.53.3.603.

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology, 90*(1), 175–181. https://doi.org/10.1037/0021-9010.90.1.175.

Peterson, C., & Seligman, M. E. P. (1984). Causal explanations as a risk factor for depression: theory and evidence. *Psychological Review, 91*(3), 347–374. https://doi.org/10.1037/0033-295X.91.3.347.

Peterson, C., Semmel, A., von Bayer, C., Abramson, L., Metalsky, G., & Seligman, M. E. P. (1982). The attributional style questionnaire. *Cognitive Therapy and Research, 6*(3), 287–300. https://doi.org/10.1007/BF01173577.

*Peterson, C., Smith, D.A. F., & Pintrich, P.R. (1988). *Explanatory style and strategies for learning.* University of Michigan. Unpublished data.

Peterson, C., Villanova, P., & Raps, C. S. (1985). Depression and attributions: factors responsible for inconsistent results in the published literature. *Journal of Abnormal Psychology, 94*(2), 165–168. https://doi.org/10.1037/0021-843X.94.2.165.

*Pierce, M. A., & Henry, J. W. (1993). *Attributional style as a predictor of success in college mathematics (Tech. Rep. No. 143).* Statesboro: Georgia Southern University.

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*(2), 322–338. https://doi.org/10.1037/a0014996.

Pustejovsky, J. E., & Tipton, E. (2018). Small-sample methods for cluster-robust variance estimation and hypothesis testing in fixed effects models. *Journal of Business & Economic Statistics, 36*(4), 672–683.

R Core Team. (2018). *R: a language and environment for statistical computing.* Vienna: R Foundation for Statistical Computing URL: https://www.R-project.org. Accessed 3 March 2018.

*Ralph, J. A., & Mineka, S. (1998). Attributional style and self-esteem: the prediction of emotional distress following a midterm exam. *Journal of Abnormal Psychology,* 107(2), 203–215. https://doi.org/10.1037/0021-843X.107.2.203.

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance a systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353–387. https://doi.org/10.1037/a0026838.

Rigby, B. N., & Huebner, E. S. (2005). Do causal attributions mediate the relationship between personality characteristics and life satisfaction in adolescence? *Psychology in the Schools, 42*(1), 91–99. https://doi.org/10.1002/pits.20026.

*Rowe, J. E., & Lockhart, L. K. (2005). Relationship of cognitive attributional style and academic performance among a predominantly Hispanic college student population. *Individual Differences Research, 3*(2), 136–139.

Sanjuán, P., & Magallares, A. (2009). *Coping strategies as a link between optimistic explanatory styles and well-being*. In T. Freire (Ed.), *Understanding positive life: Research and practice on positive psychology* (pp. 167–180). Lisbon: Climepsi Editores.

*Satterfield, J. M., Monahan, J., & Seligman, M. E. (1997). Law school performance predicted by explanatory style. *Behavioral Sciences & the Law, 15*(1), 95–105.

*Schulman, P. (1995). Explanatory style and achievement in school and work. In G. Buchanan & M. E. P. Seligman (Eds.), *Explanatory style* (pp. 159–171). Hillsdale: Lawrence Erlbaum.

Seligman, M. E. P. (1991). *Learned Optimism*. New York: Houghton Mifflin.

Seligman, M. E., & Schulman, P. (1986). Explanatory style as a predictor of productivity and quitting among life insurance sales agents. *Journal of Personality and Social Psychology, 50*(4), 832–838.

Sheldon, K. M., & Houser-Marko, L. (2001). Self-concordance, goal-attainment, and the pursuit of happiness: Can there be an upward spiral? *Journal of Personality and Social Psychology, 80*, 152–165. https://doi.org/10.1037/0022-3514.80.1.152.

Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To what extent and under which circumstances are growth mind-sets important to academic achievement? Two meta-analyses. *Psychological Science, 29*(4), 549–571. https://doi.org/10.1177/0956797617739704.

Smith, P., Caputi, P., & Crittenden, N. (2013). Measuring optimism in organizations: development of a workplace explanatory style questionnaire. *Journal of Happiness Studies, 14*(2), 415–432. https://doi.org/10.1007/s10902-012-9336-4.

Steel, P. D., & Kammeyer-Mueller, J. D. (2002). Comparing meta-analytic moderator estimation techniques under realistic conditions. *Journal of Applied Psychology, 87*(1), 96–111.

Sweeney, P. D., Anderson, K., & Bailey, S. (1986). Attributional style in depression: a meta-analytic review. *Journal of Personality and Social Psychology, 50*(5), 974–991. https://doi.org/10.1037/0022-3514.50.5.974.

Tatar, M. (1998). Primary and secondary school teachers' perceptions and actions regarding their pupils' emotional lives. *School Psychology International, 19*(2), 151–168.

Thompson, M., Kaslow, N. J., Weiss, B., & Nolen-Hoeksema, S. (1998). Children's attributional style questionnaire-revised: psychometric examination. *Psychological Assessment, 10*(2), 166–170. https://doi.org/10.1037/1040-3590.10.2.166.

*Tiggemann, M., & Crowley, J. R. (1993). Attributions for academic failure and subsequent performance. *Australian Journal of Psychology,* 45(1), 35–39.

*Tippett, S. R. (2006). *Examination of class and cultural variables, explanatory* style, *and academic achievement among Native American and Caucasian college students* (Doctoral dissertation). Stillwater: Oklahoma State University.

Travers, K., Creed, P., & Morrissey, S. (2015). The development and initial validation of a new scale to measure explanatory style. *Personality and Individual Differences, 81*, 1–6. https://doi.org/10.1016/j.oaid.2015.01.045.

*Villanova, P., Peterson, C., & Kryger, J. E. (1988). *Explanatory style and academic goals*. Northern Illinois University. Unpublished manuscript.

*Ward, C. W. (2003). Explanatory styles among undergraduate students in Christian higher education. Part 1: a single-institution case study. *Christian Higher Education, 2*(2), 169–185.

Weiner, B. (1974). *Achievement motivation and attribution theory.* Morristown: General Learning Press.

Weiner, B. (1979). A theory of motivation for some classroom experiences. *Journal of Educational Psychology, 71*(1), 3–25. https://doi.org/10.1037/0022-0663.71.L3.

Xenikou, A., Furnham, A., & McCarrey, M. (1997). Attributional style for negative events: a proposition for a more reliable and valid measure of attributional style. *British Journal of Psychology, 88*(1), 53–69. https://doi.org/10.1111/j.2044-8295.1997.tb02620.x.

*Yates, S. M. (1999). Students' optimism, pessimism and achievement in mathematics: a longitudinal study. In *Proceedings of the 22nd annual conference of the Mathematics Education Research Group of Australasia (MERGA)* (pp. 561–567).

*Yates, S. M., Yates, G. C. R., & Lippett, R. M. (1995). Explanatory style, ego-orientation and primary school mathematics achievement. *Educational Psychology, 15*(1), 23–34. https://doi.org/10.1080/0144341950150103.

*Yee, P. L., Pierce, G. R., Ptacek, J. T., & Modzelesky, K. L. (2003). Learned helplessness attributional style and examination performance: enhancement effects are not necessarily moderated by prior failure. *Anxiety, Stress, and Coping, 16*(4), 359–373. https://doi.org/10.1080/0003379031000140928.

Yuan, W., & Wang, L. (2016). Optimism and attributional style impact on the relationship between general insecurity and mental health. *Personality and Individual Differences, 101*, 312–317. https://doi.org/10.1016/j.paid.2016.06.005.

Zautra, A. J., Guenther, R. T., & Chartier, G. M. (1985). Attributions for real and hypothetical events: Their relation to self-esteem and depression. *Journal of Abnormal Psychology, 94*(4), 530–540. https://doi.org/10.1037/0021-843X.94.4.530.

Tamara Gordeeva. Lomonosov Moscow State University Faculty of Psychology, Department of Psychology of Education. International Laboratory of Positive Psychology of Personality and Motivation, National Research University Higher School of Economics, Russia. E-mail: tamgordeeva@gmail.com; Web site: https://istina.msu.ru/profile/GordeevaTO./, https://www.hse.ru/en/org/persons/9959426

Current themes of research:

Optimism, academic motivation, motivation to learn, well-being, academic performance.

Most relevant publications in the field of Psychology of Education:

Gordeeva T.O., Sychev O.A., Sidneva A.N., Pshenichniuk D.V. (2018). Academic Motivation of Elementary School Children in Two Educational Approaches — Innovative and Traditional. *Psychology in Russia: State of the Art*, vol. 11, No. 4. pp. 22–39.

Gordeeva T.O., Sychev O.A., Shepeleva E.A. (2015). Intelligence, motivation, and coping strategies as factors of schoolchildren's academic performance. *Voprosy Psykhologii*, No. 1. pp. 15–26.

Gordeeva T.O., E.N. Osin, N.E. Kuz'menko, D.A. Leont'ev, O.N. Ryzhova (2013). Efficacy of the Academic Competition (Olympiad) System of Admission to Higher Educational Institutions (in Chemistry). *Russian Journal of General Chemistry*, V. 83. N. 6. pp. 1272–1281. Pleiades Publishing, Ltd.

Gordeeva T.O., Sychev O.A. (2012). Internal sources of persistence and its role in success in learning activity. *Psychology of Education*, No. 1. pp. 33–48.

Gordeeva T.O., Osin E.N. (2011). Optimistic attributional style as a predictor of well-being and performance in different academic settings: A new look at the problem. *The Human Pursuit of Well-Being: A Cultural Approach*. I. Brdar (Ed.). Springer, Dordrecht, London, New York, 2011. pp. 59–174.

Stetsenko, A., Little, T.D., Gordeeva, T.O., Grasshof, M., Oettingen G. (2000). Gender effects in children's beliefs about school performance: A cross-cultural study. *Child Development*, V. 71 (2). pp. 517–527.

Kennon Sheldon. University of Missouri, Missouri, Columbia, USA and International Laboratory of Positive Psychology of Personality and Motivation, National Research University Higher School of Economics, Moscow, Russia. E-mail: SheldonK@missouri.edu; Web site: http://web.missouri.edu/~sheldonk/https://www.hse.ru/en/org/persons/129022524

Current themes of research:

Goals. Motivation. Psychological well-being.

Most relevant publications in the field of Psychology of Education:

Yang Y., Li W., Sheldon K. M., Kou Y. Chinese adolescents with higher social dominance orientation are less prosocial and less happy: A value-environment fit analysis. *International Journal of Psychology*, 2018.

Oleg Sychev. Shukshin Altai State University for Humanities and Pedagogy, Department of Psychology of Education, Biysk, Russia, Korolenko str., 43-213, 659333 Biysk, Russia. E-mail: osn2@mail.ru; Web site: http://www.bigpi.biysk.ru/psyfac/viewpage.php?page_id=21

Current themes of research:

Educational systems that promote intrinsic motivation. Development and adaptation of academic motivation scales. Moral development of adolescents. Academic motivation in primary school.

Most relevant publications in the field of Psychology of Education:

Gordeeva T.O., Sychev O.A., Sidneva A.N., Pshenichniuk D.V. (2018). Academic Motivation of Elementary School Children in Two Educational Approaches — Innovative and Traditional. *Psychology in Russia: State of the Art*, vol. 11, No. 4. pp. 22–39.

Gordeeva T.O., Sychev O.A., Shepeleva E.A. (2015). Intelligence, motivation, and coping strategies as factors of schoolchildren's academic performance. *Voprosy Psykhologii*, No. 1. pp. 15–26.

Gordeeva T.O., Sychev O.A. (2012). Internal sources of persistence and its role in success in learning activity. *Psychology of Education*. No. 1. pp. 33–48.

Gordeeva T.O., Sychev O.A., Ghizhitsky V.V., Gavrichenkova, T.K. (2017). Intrinsic and Extrinsic Academic Motivation Scale for Schoolchildren. *Psychological science and education*, 2, pp. 57–64.

Gordeeva T.O., Ghizhitsky V.V., Sychev O.A., Gavrichenkova, T.K. (2016). Self-respect motivation and respect by others as factors of academic performance and persistence in learning activity. *Psychological Journal*, 37, 2, pp. 57–68.

Affiliations

Tamara Gordeeva [1,2] · Kennon Sheldon [3,4] · Oleg Sychev [5]

1 Department of Psychology of Education, Lomonosov Moscow State University Faculty of Psychology, Moscow, Russia

2 International Laboratory of Positive Psychology of Personality and Motivation, National Research University Higher School of Economics, Mokhovaya, 11-9, 125009 Moscow, Russia

3 International Laboratory of Positive Psychology of Personality and Motivation, National Research University Higher School of Economics, Moscow, Russia

4 Department of Psychological Sciences, University of Missouri-Columbia, 112 McAlester Hall, Columbia, MO 65211, USA

5 Department of Psychology of Education, Shukshin Altai State University for Humanities and Pedagogy, Korolenko str., 43-213, Biysk, Russia 659333