

In Search of Hidden Talents: Stress-Adapted Students, Classroom Characteristics, and Academic Achievement

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ABSTRACT

Researchers focusing on stress-adapted students (students who have experienced developmental adversity) have made suggestions about how to play to the cognitive strengths, or hidden talents, of these students. The results of studies in this area may provide a clear set of pedagogical recommendations for teachers who wish to adjust their practice to meet the needs of students who have experienced social and economic disadvantage. This study tested the relationships between stress-adaptedness in middle and high school students, pedagogical techniques hypothesized to benefit stress-adapted students, classroom environments characterized by conversation and movement, and class average academic success. Results showed a significant relationship between the number of stress-adapted students in a class and the class average grade, such that classrooms with more stress-adapted students tended to have lower class average grades. A positive correlation was also observed between the classrooms with more conversation and movement and class average grades. This modest association was not found, however, after controlling for stress-adaptedness and pedagogical techniques. Further moderation hypotheses were not supported. Results are discussed in terms of implications for teaching practices and areas for future research.

KEYWORDS

Hidden Talents, Early Life Adversity, Pedagogy, Strength-Based Approach

INTRODUCTION

Traditional models of the interrelation between early developmental stress (e.g., early life adversity), cognitive developmental outcomes, and educational outcomes tend to be primarily deficit-focused. Consistent with these models,

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numerous studies have shown that stress exposure is associated with impaired executive functioning, memory, language development, reading and math skills, and lower IQ (Blair et al., 2011; Farah et al., 2006, Hackman et al., 2015). Whereas there is robust empirical evidence framed in deficit perspectives, there is a small but emerging program of research that takes an adaptationists approach to investigating the relation between stress exposure and cognitive and educational outcomes. The adaptation-based approach rejects the notion that exposure to stress universally impairs cognition and instead focuses on the kinds of cognitive advantages – often referred to as hidden talents – that individuals may develop as a result of exposure to stress from, for example, harsh and unpredictable environments (Ellis et al., 2023; Frankenhuis, & Nettle, 2019; Ellis et al., 2017; Frankenhuis & de Weerth, 2013). Researchers in this area recognize the real and negative impact that adversity can have on cognitive development but also suggest that a broader understanding of the impact of adversity is obtainable by also investigating the ways in which these environments might enhance cognition. The results of such investigations can subsequently inform policy and practice in educational contexts (Ellis et al., 2023; Frankenhuis et al., 2020).

Within the hidden talents framework, the phrase “stress-adapted” is used to describe individuals who have experienced social and economic disadvantage (Frankenhuis et al., 2019) or a harsh and unpredictable environment during development (Ellis et al., 2009). Within educational research, students who could be described as stress-adapted are commonly referred to as “at-risk,” “high-risk,” or “vulnerable” (Angelis et al., 2014; Battin-Pearson et al., 2000; Boyer, 1983). In this case, the “risk” embedded in the terms refers to risk of educational failures or non-completion. The so-termed hidden talents developed by stress-adapted or “at-risk” students can be best understood in terms of specializing and sensitizing individuals such that they are optimally adapted to their environments (Ellis et al., 2017). The specialization hypothesis asserts that individuals will adapt to their developmental environment, such that they are better able to solve problems relevant to their immediate ecological surroundings. In harsh and unpredictable environments, or environments that are associated with early life adversity, this might mean that a person could be better at shifting their attention quickly to accommodate rapid changes in their environment or identifying angry faces, both of which could be protective in dangerous situations (Mittal et al., 2015; Pollak et al., 2009). Complementing the specialization hypothesis is the sensitization hypothesis, which outlines how individuals not only develop skillsets that enable them to adapt to their environments, but also that individuals perform best when they demonstrate their adaptations within the correct evolutionary-developmental context (Frankenhuis & de Weerth, 2013). For example, Mittal et al. (2015) showed that adults who grew up in unpredictable environments performed best on task-shifting assessments after they read a fictitious news article emphasizing economic recession and unpredictable economic climates. Mittal and colleagues (2015) findings provide support for the sensitization hypothesis by showing that when cognitive skills are tested in an environment that matches the developmental environment of the participant, performance is improved.

The sensitization and specialization hypotheses outline what kinds of cognitive advantages stress-adapted students might have and why they might have

them (Ellis et al., 2017; Frankenhuis & de Weerth, 2013). These hypotheses also provide insight into what kinds of environments might best showcase the hidden talents of stress-adapted students. Such information could be used by teachers to guide their teaching practices when working with stress-adapted students. For example, using ecologically relevant materials or connecting content to students' interests and cultures is considered a best practice by educators and supported by research testing the sensitization and specialization hypothesis (Tomlinson et al., 2003; Frankenhuis & de Weerth, 2013). In their formulation of the hidden talents perspective, Ellis et al., (2017) hypothesized that stress-adapted students will respond well to task-shifting, such as moving through several activities that each do not required sustained attention. They further suggest stress-adapted students will respond better to immediate feedback and rewards relative to delayed. Further, in-line with the sensitization hypothesis, the authors also suggest that when students' learning environment matches their adaptive environment, their talents will not only enable them to match the outcomes of their non-stress-adapted peers, but potentially exceed them. To date, however, there are no empirical tests of how sensitization and specialization impact classroom learning in adolescents. However, Ellis and colleagues (2017) indicate that classrooms in which movement and background noise (similar to what might be found living in close proximity to neighbors and family in low-income neighborhoods) would offer a better evolutionary-developmental context for stress-adapted students. The current study seeks to apply the hidden talents framework and test the specialization and sensitization hypotheses using information provided by middle and high school teachers in the United States.

Ecologically relevant content. Research in both evolutionary developmental psychology and educational psychology concur that it is imperative to frame classroom material in a way that connects with students. Tomlinson and McTighe (2006), in their guidelines to implementing differentiated instruction, encourage teachers to connect content to students' backgrounds and interests in order to increase motivation and to make learning relevant to their lives. Frankenhuis and de Weerth (2013), in their review of research on how early life stress shapes cognition, suggest that individuals who experienced stress in their early childhood should demonstrate improved detection, learning, and memory on tasks that are ecologically relevant to them, when compared to peers that experienced lower levels of developmental stress. Richardson et al. (2016) concur with Frankenhuis and de Weerth (2013) and further argue that career and technical education programs offer an ideal model for stress-adapted students because they frame the content in ways that appeal to adolescent's current biopsychosocial context, which includes improved resource control, peer status, and access to mates. When students learn from adults who have professional experience related to their content area, their learning is connected to the possibility of immediate application, which in turn, is associated with immediate resource control (Richardson et al., 2016). Demonstrating the immediate usefulness of content is especially important for at-risk students who come from harsh and unpredictable environments because they may place greater emphasis on information that will aid in achieving short-term goals (like gaining social status; Ellis et al., 2009).

Empirical evidence to support the importance of framing content in ecologically relevant ways come from both evolutionary developmental psychology

and education research. Walkington (2013) described ecologically relevant content in terms of context personalization, a type of interest-based intervention where instructional contexts are matched to students' out-of-school interests. In Walkington's (2013) study, ninth grade students used technology-based content personalization to match math stories with their out-of-school interests, like sports, music, and movies. Students who completed math problems that matched their interests showed significant improvement in secondary mathematics skills compared to when they learned new math content without context personalization. Schliemann and Carraher (2002) found similar results with Brazilian third graders who had experience in Brazilian street markets, demonstrating that the children were better able to solve algorithmic math problems when the problems had to do with buying and selling goods when compared to conceptual algorithmic math problems. The findings of Schliemann and Carraher's (2002) study provides evidence that when given a problem with ecologically relevant context, children can better demonstrate the skills tested in schools. The idea that students generally, and stress-adapted students in particular, may benefit academically when content is ecologically relevant is supported both theoretically (by proponents of differentiated instruction, i.e., Tomlinson & McTighe, 2006 and the hidden talents approach, i.e., Frankenhuis & de Weerth, 2013) and empirically (Schliemann & Carraher, 2002; Walkington, 2013), but has yet to be tested with stress-adapted students in a secondary level classroom.

Task shifting. Individuals who developed in a harsh and unpredictable environment may have adapted a diffuse attentional style, which is hypothesized to be protective in an environment with imminent threats and scarce resources (Frankenhuis et al., 2016). Task shifting, when understood as the opposite of sustained attention, is often described as an executive dysfunction in the educational psychology literature (Razza et al., 2010; Andrade et al., 2009). However, it can also be appropriately conceptualized as a conditional adaptation or cognitive strength because it is likely useful and protective in harsh and unpredictable environments (Frankenhuis & Nettle, 2019; Richardson et al., 2016). Empirical investigations of the relationship between task shifting ability and exposure to harsh and unpredictable environments have provided support for this idea in studies of both children and adults. For example, Mittal et al. (2015) found that adults who had experienced unpredictable childhoods performed better on measures of task shifting than adults who had experienced predictable childhood environments. Vandemboucke et al., (2016) found similar results with children from low-income families. Vandemboucke and colleagues (2016) demonstrated that children with low-educated mothers scored better on response shifting (a component of cognitive flexibility that develops before task shifting) than children from high-income families with highly-educated mothers. Similarly, Na and Chan (2016) showed that high-risk children had better response inhibition (an aspect of inhibitory control related to task shifting) than their low-risk peers. In total, the empirical evidence supports the hypothesis that stress-adapted individuals are often better than their peers at task shifting, which suggests that teachers may be able to capitalize on this strength in their students.

Immediate rewards. Adolescents in general, and stress-adapted adolescents in particular, are drawn to immediately gratifying experiences, which can make it difficult for them to appreciate learning that leads to long-term benefits rather than short-term benefits (Richardson et al., 2016). Harsh and unpredictable environments

may bias individuals to devalue the future in favor of short-term opportunities and rewards (Ellis et al., 2009). Preference for immediate rewards is hypothesized to be an adaptive response to uncertain and rapidly changing environments (Mittal et al., 2015). Consistent with this hypothesis, Suor et al. (2017) found that environmental harshness at age 2 was predictive of better reward-oriented problem solving at age 4, when compared to visual problem solving. The authors also found that children from unstable environments favored immediate rewards over future payoffs relative to peers from stable environments. In research with college students, Griskevicius et al. (2011) found that students from low SES backgrounds favored higher risk, immediate rewards over low risk, long term higher rewards, especially when primed by unfavorable mortality and resource cues. Taken together, previous research demonstrates that stress-adapted individuals will be more likely to be motivated by immediate rewards, and thus, their use in the classroom could result in improved learning outcomes for stress-adapted students.

Learning environment. In accordance with the sensitization hypothesis (Ellis et al., 2017), individuals will be able to best demonstrate their cognitive adaptations when the environment they are functioning in matches the environment they developed in. Studies theoretically aligned with an adaptation-based approach to development in educational contexts should be based in a context that mirrors students' ecologies. In the case of stress-adapted students, this will mean conversation rather than pencil and paper, because this more closely resembles how children typically confront problems in real-life (Frankenhuis & de Weerth, 2013). Additionally, environments that allow for movement and conversation may simulate the context in which stress-adapted students developed their skills, and will therefore play to their hidden talents better than quiet, controlled environments (Ellis et al., 2017). There is very little empirical evidence of the sensitization hypothesis with school-aged children, however. One study conducted by Schliemann and Carraher (2002) found that low-income Brazilian third graders showed higher performance in mathematical algorithms when allowed to solve problems in their minds (which they did frequently outside of school) when compared to using pencil and paper. This demonstrates that when given the opportunity to demonstrate their skills in a way that matched the context in which they learned the skill, the students performed better.

Current Study

The purpose of the current study was to apply an adaptationist framework in the form of hidden talents to understand middle- and high-school students' education outcomes by testing the specialization and sensitization hypotheses (Ellis et al., 2017; Frankenhuis & de Weerth, 2013). To do so, the interrelations between stress-adaptedness, classroom environment, teachers' pedagogical techniques, and the students' class average grade were examined. Previous research indicates that using ecologically relevant material and structuring lessons that incorporate task-shifting and immediate rewards in classrooms that allow for conversation and movement should result in academic gains for stress-adapted students (Ellis et al., 2017; Frankenhuis & de Weerth, 2013; Griskevicius et al., 2011; Mittal et al., 2015). Based on these theoretical and empirical works, we asked teachers to complete a questionnaire that addressed the stress-adaptedness of students in their class,

pedagogical techniques used that might benefit stress-adapted students, their classroom environment (i.e., conversation and movement), and their class average grade as the outcome. Four hypotheses were tested:

H1: Stress-adaptedness, Pedagogical Techniques, and the Classroom Environment will each be linearly related to Class Average.

H1A: Stress-adaptedness will be negatively related to Class Average

H1B: Pedagogical Techniques will be positively related to Class Average

H1C: Classroom Environment will be positively related to Class Average

H2: Stress-adaptedness, Pedagogical Techniques, and Classroom Environment, together, will each have unique associations with Class Average.

H3: Pedagogical Techniques will moderate the association between Stress-Adaptedness and Class Average such that classrooms of stress-adapted students will have higher class averages when teachers use more beneficial pedagogical techniques compared to when they use fewer.

H4: Classroom Environment will moderate the association between Stress-Adaptedness and Class Average such that classrooms of stress-adapted students will have higher class averages in classrooms with more conversation and movement compared to classrooms with less conversation and movement.

METHOD

Participants

Participants included 168 teachers of grades 6 – 12 (mode = 11th grade) who volunteered without compensation to take the survey in March of 2020. Teachers had between 1 and 36 years of experience ($M = 14.75$, $SD = 9$), and between 4 and 70 students in the class they reported on ($M = 20$) The majority were located in New York state ($n = 117$) and were teaching classes that blended face-to-face and online contexts ($n = 115$).

Procedures

A 28-question Internet-based survey created for the purposes of this study was distributed electronically via email and social media. The survey was used to obtain information from teachers regarding their teaching experience and current teaching assignment. Teachers answered questions about their students' stress exposure to assess stress-adaptedness, pedagogical techniques, classroom environment, and classroom-level academic achievement.

Questionnaire Pilot. Teachers completed questions that are novel to this study. Pilot testing was conducted to establish the validity of the instruments. The content validity of the questionnaire was established through several think-aloud

interviews and pilot testing with seven teachers who did not participate in the study. During this process, teachers explained what they thought each question was asking and why they thought the question was being asked. For example, in response to the question, “How often do you plan lessons that involve noise or talking?” several teachers indicated that they believed this question was related to their classroom management skills. The question was reworded to read, “In a given week, how often do you plan lessons that involve students talking and interacting with people at the same time? (For example, working in groups, giving answers to problems orally, or otherwise doing activities that do not necessitate a quiet atmosphere.)” The intention was to remove any potential negative connotations that were implied and to provide examples that would help respondents see that the goal of the question was to measure teachers’ facilitation of classrooms where conversation and movement were part of learning, and not a by-product of unwanted student behaviors.

Additionally, teachers were given the opportunity to comment on the ease of completion of the questionnaire and the likelihood that they would be able to provide accurate information about the stress-exposure of their students. Of the seven teachers included in the face-validity pilot, when asked how difficult they would find it to answer the questions about students’ backgrounds, five teachers felt confident in their ability to answer these questions accurately with the help of learning management systems (LMS; software applications used to document, track, and report student information such as grades, attendance, individualized educational plans, and emergency contacts). Two teachers indicated that it would be difficult for them to answer the questions because they lacked the technological skills necessary to locate the information in their LMS; however, both explained they were certain the information was accessible to them. This feedback was indicative of the fact that teachers from a variety of districts felt that they could accurately answer questions about the backgrounds of their students, therefore justifying the use of teacher-reported information about detailed student demographic information.

As a result of COVID-19, the questions required minor rewording after pilot testing (for example, changing wording that implied teachers would be working face-to-face with students). Whereas the original survey question regarding student movement read, “How often do you plan lessons that involve students moving throughout the classroom? (For example, to different learning stations, different seating arrangements, or to gather materials.),” the question now asks, “How often do you plan lessons that involve students moving during class time? (For example, having a stretch break, or using body language or props to engage or answer questions.)”

Stress-adaptedness. Four items about the stress exposure of the students in the focal classes were included in the teacher’s questionnaire. Teachers were asked to report their best estimate about how many students in each class qualify for free or reduced lunch, live in households that could be considered single-parent households, have at least one working phone number that can be used to contact parents/guardians, and live in homes where English is not the primary language spoken.

A *stress-adapted student score* was created from the responses provided to these items in four steps. First, the number provided in response to “For how many students in this class do you have at least one working phone number that you can

use to contact parents/guardians?” was subtracted from the total number of students in the class to determine how many students *do not* have at least one working phone number. This was done so that a higher number indicates an increased possibility of social or economic disadvantage. Next, the number provided in response to each of the four questions was summed (total stress score). To account for the number of students in each class, the student number was multiplied by four to determine what the maximum score for each class could be (maximum stress score). The final step was to divide the total stress score by the maximum stress score to create a stress score in the form of a percent, which was reflective of how many students were exposed to stress relative to the number of students in the class. The possible range of scores as 0% to 100%. Classroom scores for stress-adaptedness scores ranged from 0% to 85%, with a mean of 29% ($SD = 18.18$).

The stress-adapted student score combined the characteristics described in educational and evolutionary developmental research regarding social and economic disadvantage. Indicators like maternal education that would be difficult for teachers to know were left out. Maternal investment (which is easier to study than familial investment because children most often live with their mothers) is measured here deductively by asking teachers if they have working phone numbers for the student's home. The resulting measure of possible stressors was pilot-tested to ensure that teachers would be able to provide the information requested about their students. Most of the teachers involved in the pilot indicated that they would know how many of their students qualified for free or reduced priced lunch, live in single-parent homes, speak a language other than English in their home, or if they have no working method of communication with the student's family. These items had high internal consistency ($\alpha = .76$), indicating that the measure was reliable.

Pedagogical Techniques. Teachers answered three questions designed to assess how often they included in their lesson plan specific pedagogical techniques that might benefit stress-adapted students. The techniques of interest include: *ecologically relevant examples or materials*, *immediate rewards*, and *task-shifting activities*. The questions read, “In this class, how often do you plan to present your content in a way that connects to students' interests and lives?”, “...how often do you plan to teach lessons that include some form of immediate rewards (such as verbal praise, additional privileges, or physical rewards like pencils or candy)?” and “...how often do you plan lessons that involve shifting focus from one task to another? (For example, moving from one activity to another, moving from individual work to class discussion, switching from using one skill to another, or moving from one software platform to another.)” Response options to these items used a 4-point Likert-style scale of 1 (*almost never*), 2 (*rarely*), 3 (*sometimes*), and 4 (*almost always*). These three items were summed to create a pedagogical techniques score, with a minimum possible score of 3 and a maximum of 12. Participants scores ranged from 6 – 12, with a mean score of 10.07 ($SD = 1.46$).

Classroom Environment. Teachers answered two items about their typical classroom environment, specifically about how much conversation and movement they incorporate into learning activities. The two items read: “In this class, how often do you plan lesson that involves students talking and interacting with multiple people at the same time? (For example, working in groups, giving answers to problems orally, or otherwise doing activities that do not necessitate a quiet atmosphere.); and “In this

class, how often do you plan lessons that involve students moving during class time? (For example, having a stretch break, or using body language or props to engage or answer questions.) Items were scored on the same 1 (*almost never*) to 4 (*almost always*) scale and the items were summed to create the classroom environment score, with a minimum possible score of 2 and a maximum of 8. The items were moderately to strongly correlated ($r = .47, p < .05$). Participant scores ranged from 2 to 8, with a mean of 4.96 ($SD = 1.53$).

Class Average. Information regarding *class average* was gathered through three items. Teachers were asked to provide the lowest and highest individual student grade (in percent) for the focal class and to characterize the class as: low performing, on average; average; high performing, on average; or, a heterogeneous mix. The current grade (in percent) provided by the teacher was used to determine the *Class Average* score. Teachers reported classroom averages ranging from 30% to 100%, with a mean of 78.93% ($SD = 11.92\%$).

RESULTS

The results of a correlations testing hypotheses H1 A, B, and C indicate that a strong negative relationship exists between Stress-adaptedness and Class Average ($r(166) = -.52, p < .05$). The correlation between Classroom Environment and Class Average was positive, as predicted, but more modest ($r(166) = .16, p < .05$). A significant correlation between Pedagogical Techniques and Class Average was not detected ($r(166) = -.09, p > .05$). The results of a multiple linear regression (Table 1) testing H2, that Stress-adaptedness, Pedagogical Techniques, and Classroom Environment would each have unique associations showed that Stress-adaptedness continued to show a strong negative association [$\beta = -.50, p < .05$] after controlling for the other two factors. Classroom Environment [$\beta = .11, p > .05$] no longer showed a significant association nor did Pedagogical Techniques [$\beta = -.02, p > .05$]. The results of a regression moderation analysis testing H3 (that Pedagogical Techniques would moderate the relationship between Stress-adaptedness and Class Average) showed that, while also controlling for Classroom Environment, the interaction term was not statistically significant [$\beta = .06, p > .05$]. Finally, to test H4 (that Classroom Environment will moderate the relationship between Stress-adaptedness and Class Average), a second moderation analysis was conducted controlling for Pedagogical Techniques. Results of this analysis also showed that the interaction term was also not significant [$\beta = -.03, p > .05$].

Table 1. Regression Coefficients for Predictors of Class Average

Variables	<i>b</i>	β	<i>t</i>	<i>p</i>	Partial <i>r</i>
Constant	86.31		15.43	.00	
Stress-Adapted Student Score	-0.33	-.50	-7.26	.00	-.49
Classroom Environment Score	0.83	.11	1.50	.14	.12
Pedagogical Techniques Score	-0.19	-.02	-0.32	.75	-.03

Note: $R^2 = .28, n = 168$

DISCUSSION

This study investigated whether stress-adapted students perform better in classes where teachers play to their strengths by using specific pedagogical techniques in specific classroom environments. Drawing on the hidden talents perspective (Ellis et al., 2017), the objective of this study was to test the sensitization and specialization hypotheses by analyzing how teachers' pedagogical techniques, combined with the classroom environments in which they give this instruction, can together impact the academic achievement of stress-adapted students who have experienced social and economic disadvantage.

We found that on average, classes that had a higher percentage of students exposed to social and economic stressors (being qualified for free or reduced priced lunch, living in single-parent homes, speaking a language other than English in their home, and having no working method of parent-teacher communication) tended to have lower class average grades. This relationship was unchanged when teachers used the teaching practices we hypothesized would play to the strengths of stress-adapted students and when stress-adapted students learned in classrooms that allowed for noise and movement. Our findings are consistent with the well-documented relationship between experiencing early life adversity as measured through traditional indicators of socioeconomic status (maternal education, household income, maternal occupation, student qualification for free or reduced priced lunch) and reduced academic achievement (such as, performance on standardized math and reading tests, graduation rates; Sirin, 2005). We conclude that the relationship between early life adversity and lower academic achievement continues to be an issue in need of attention.

Our results showing that when teachers used pedagogical techniques of interest in classrooms environments that are similar to stress-adapted students home environments, class average grades were not improved does not offer support for the sensitization and specialization hypotheses (Frankenhuis & de Weerth, 2013) and are inconsistent with the assertions made by proponents of differentiated instruction (Tomlinson, 2000) and the hidden talents approach (Ellis et al., 2017). One reason for this could be that teachers were challenged by the new teaching modes that accompanied the COVID-19 pandemic. Although more than half of our participants indicated that they planned to incorporate the teaching techniques in question in classrooms that allowed for noise and movement, the majority of teachers ($n = 115$) in the study were teaching both face-to-face and online students at the same time due to COVID-19, which was a relatively new teaching modality for K-12 teachers. Although they may have *planned* to use teaching techniques that should improve the academic success of stress-adapted students in their classes, they may not be *executing* the techniques as well as they would have if they were teaching in a context that they were more familiar with.

An alternative explanation for our findings is that even if teachers were using teaching techniques and creating classroom environments that support stress-adapted students, the effects of their efforts may be washed out by counter-effects created by a change in teaching modality (i.e., changing to remote learning due to COVID-19). The social and economic disadvantages of stress-adapted students' environments may have been exacerbated by the learning from home transition. For

example, students who live in homes in which English is not the primary language may begin to lose English language proficiency as their exposure to native speakers declines. English language learners typically develop social vocabulary before academic vocabulary. Students without advanced fluency might have found the transition to online learning very difficult given their main source of practice (socializing) was drastically reduced (Hill & Miller, 2013).

Furthermore, access to consistent high-speed internet and computers with large processing capacities necessary to run several Internet-based learning programs simultaneously was likely a challenge for students who qualify for free or reduced priced lunch. This could mean that although teachers were structuring lessons that would theoretically improve stress-adapted student performance, what they were doing could have actually *hindered* a student's ability to succeed, especially if the student did not have access to the right technological resources. Empirical evidence suggests that individuals who have experienced social and economic disadvantage may have enhanced task-shifting abilities (Mittal et al., 2015). In this case, however, the use of task shifting, which included moving from one internet-based software platform to another, may not have had benefitted stress-adapted students in the way that the hidden talents approach suggested (Ellis et al., 2017) or that previous research has demonstrated.

A final explanation for the inconsistency between our results and previous research is that the hidden talents investigated in this study may not be connected to the stressors we measured or present in adolescents. Early exposure to physical abuse is associated with increased accuracy and speed at detecting angry faces (Pollak et al., 2009), but the same outcome might not occur in an individual who experienced economic poverty without abuse, which indicates that specific forms of adversity may lead to specific hidden talents. It is possible that the three facets of learning addressed in this study (task-shifting, responding to immediate rewards, and responding to ecologically relevant content) are not related to the stressors measured. Furthermore, it could be that the specific specialization skills focused on presently were not evident in adolescents. The hidden talents measured in this study may have revealed themselves in children or adult populations and/or alternative hidden talents may have been demonstrated by the age range being taught by teachers in on this study. The adolescent students demonstrated by adolescents could be different than those demonstrated by children or adults and not captured by the measure used in this study. Additional research is needed to examine how exposure to adverse environments can lead to hidden talents specifically observable among adolescents.

Conclusion

The hidden talents approach offers a strengths-based perspective regarding how early life adversity shapes cognition that may serve to guide teachers as they make pedagogical decisions. Theory and research based in educational psychology and evolutionary developmental psychology can be used in conjunction to create a framework for how teachers can help stress-adapted students achieve academic success. Our study explored one way that combining the guidelines put forth by differentiated instruction (Tomlinson, 2000) with the sensitization and specialization hypothesis (Frankenhuis & de Weerth, 2013; Ellis et al., 2017) might be used to

improve the educational outcomes of stress-adapted students. We demonstrated that teachers who work with stress-adapted students need additional support to help disadvantaged students find academic achievement at the same levels of their advantaged peers. Our study is important because it is the first to investigate the hidden talents approach as it relates to secondary school education. Continued examination of the application of the hidden talents framework to school settings will serve to improve the educational experiences of a long-stigmatized and underserved community of students by offering an asset-based approach to adapting pedagogy in such a way that the cognitive strengths of stress-adapted students is prioritized.

Limitations and Future Directions

One limitation of this study is that the information about the stress exposure of students was provided by teachers. Student-level information may lead to different conclusions and should be the focus of future research. Similarly, classroom observations instead of teacher self-report could lead to more reliable data about pedagogical techniques and the classroom environment. In addition, questions about early life stressors in addition to the current environment would better capture stress adaptedness. Finally, but perhaps not a limitation *per se*, this study was interrupted by COVID-19 restrictions on classroom attendance, which likely impacted the results.

Future research on the hidden talents of stress-adapted students should investigate a variety of interaction patterns. For example, because students who are exposed to stress may develop some enhanced cognitive functions and some impaired cognitive functions simultaneously; as such, it would be helpful to compare how these defects and advantages transact. Further, it would be useful to test both within groups (stress-adapted students compared to themselves) and between groups (stress-adapted students compared to students who were not stress-exposed). Analysis conducted in this way might show that stress-adapted students perform better in classroom where teachers use techniques that play to their strengths when compared to classrooms where teachers don't use such techniques. It may be that the hidden talents of these students might be evident in a within group comparison, but because stress-exposure is both enhancing and damaging, a between group comparison might hide potential cognitive enhancements. Last, the hidden talents framework should be applied beyond middle and high school students, as was done here, to younger learners and even adult learners.

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