RESILIENCE AS A PRECURSOR TO ACADEMIC SUCCESS

Barend J. van Wyk¹, Mariza van Wyk², Charl Jacobs²

¹Tshwane University of Technology (SOUTH AFRICA)
²Neurozone (SOUTH AFRICA)

Abstract

Many factors influence academic success, and much has been published on institutional factors, learning styles, teaching styles, and various cognitive and non-cognitive factors. We took a different approach and investigated the influence of brain-body system drivers related to resilience as measured by the Neurozone® Brain Performance Diagnostic [1], on academic performance. A significant positive correlation was found between academic achievement and brain-body system drivers related to resilience. Since brain-body system drivers such as exercise, sleep, silencing the mind (meditation), social safety and collective creativity as defined by Neurozone®, have all been shown to enhance resilience [5], it then becomes imperative for academic institutions to facilitate the cultivation of these behaviors in order to increase the probability of academic success.

Keywords: Resilience, Brain-Body System, Undergraduate Academic Performance, Neuroscience.

1 INTRODUCTION

The brain actively and continuously adapts at a molecular and neuronal level in the presence of a stressor. This adaptive capability determines resiliency. Effectively enhanced resilience, defined in the brain-body context as the capacity to withstand challenges that threatens stability, prevents the implosion of the brain-body system and enables a person to perform optimally, including when learning [2-4]. Resilience can be seen as a pre-requisite for academic performance: For students to be successful, they should be able to withstand a variety of stressors, including negative institutional factors, time and exam pressure, the ability to recover from negative emotional experiences such as failure or poor grades, the ability to stay optimistic and pursue a long-term goal, such as a degree or diploma, as well as financial pressures.

Resilience in an academic context has been explored by many authors: For example, Johnston-Wilder and Lee [6] defines resilience as a positive approach that allows people to overcome affective barriers presented when learning. They argue that although all types of learning require resilience, that the resilience needed to be successful in mathematics is mainly a consequence of the kind of teaching, the nature of mathematics, and the subjective, albeit pervasive, beliefs about mathematical ability. These findings support the seminal work of Yaeger and Dweck [14] who argue that based on their research, psychological interventions that change the mindset of students (what they believe or are taught about intellectual abilities and social attributes) increase resilience in educational settings. This resonates with the work of Hanson et al. [10] who showed that although factors related to educators and educational climate, such as the expectations and attitudes of educators, seem to have an influence on academic performance, the educational aspirations of students is to be the most reliable and consistent predictor of academic resilience.

Although some researchers such as Goff [13] found no significant relationships among stressors, learned resourcefulness (the ability to regulate emotions and cognitions), and academic performance from multiple regression analyses on a cohort of nursing students, this does not seem to be the case for younger students. Wong [8] showed that a higher level of perceived parental involvement, autonomy support, and greater self-regulation predicted better educational outcomes for adolescent students.

Social support, in general, seems to enhance academic resilience for both adolescent and university students. In a sample of Latino students, Perez et al. [9] reported that students who have high levels of personal and environmental protective factors such as supportive parents, friends, and participation in school activities, report higher levels of academic success than students with similar risk factors. Wilks [7] echoed these findings for a group of social work students and published on the moderating role of social support in the relationship between academic stressors and resilience.

There is also a significant body of work on socioeconomically-disadvantaged students who are academically successful based on TIMSS (Trends in International Mathematics and Science Study),
and Programme for International Student Assessment (PISA) results from developing countries. Erberber et al. [11] reported on the positive relationships between internal resilience assets (physical activity, nutrition, a safe environment), external resilience assets (provided schools, families, communities, and peers), and academic performance across socioeconomically disadvantaged students across countries. The analysis of Agasisti et al. [12] revealed that some developing countries were able to increase the share of resilient students over time as measured by the improvements in the average performance, resulting in a weaker relationship between socio-economic status and performance. They emphasize the role of school policies and practices related to issues such as extracurricular activities, school disciplinary climate, teacher turn-over, leadership, and classroom climate. These findings are echoed by Sandoval-Hernández and Białowolski [15] who also analyzed TIMSS results from developing countries and commented on the relationships between student attitude, teacher confidence, language spoken at home, time spent on mathematics at home and differences in resilience between disadvantaged and non-disadvantaged students.

For our study, we took a more holistic approach: Instead of focusing on isolated factors, we investigated the simultaneous influence of 10 brain-body system drivers related to resilience, as measured by the Neurozone® Brain Performance Diagnostic [1], on academic performance. The Neurozone® Brain Performance Diagnostic was developed initially as a tool for the corporate environment to direct behavior to achieve ultimate brain/body system optimization.

The ten critical brain-body drivers identified by Neurozone® are Exercise, Nutrition, Sleep/Wake Cycles, Silencing the Mind (mindfulness meditation), Social Safety (trust, belonging, identity, and meaning in personal and student life), Goal-Directedness (e.g., enthusiasm, optimism, curiosity), Collective Creativity (the ability of the group to solve problems and fashion novel products), Learning (study related and unrelated to course work, learning techniques), Abstraction (functional flexibility and divergent thinking), and Executive Function (e.g., brain training and voluntary and involuntary mind wandering). These drivers are based on critical factors shown to assist with the mitigation of physical, environmental and mental stressors [1].

We investigated the relationship between academic performance and resilience within a sample undergraduate Engineering and Built Environment students at the Tshwane University of Technology (TUT). The primary goal was to gauge whether students with high resilience also exhibited higher academic success. Establishing a link between these concepts within a South African sample, will not only lead to suggestions of changes in teaching in its own, but will also shed light on the multi-dimensional backdrop that contributes to a student’s resilience and, consequently, their academic performance.

2 METHODOLOGY

A total sample of (n = 744) undergraduate Engineering and Built Environment students at TUT completed the Neurozone® Brain Performance Diagnostic at the beginning of the second semester of 2018. The sample included students from various departments across the Engineering and Built Environment faculty. The diagnostic was completed online, and each student received a personalized report upon completion of the assessment. The report provided neuroscience-based behavioral recommendations that have been shown to enhance resilience.

The Neurozone® instrument uses questions to obtain an index for each of the ten key drivers. A weighted average of the ten key drivers is then used to infer a derived resilience index, and three separate questions are also used to infer a self-reported resilience index. Academic performance was the self-reported average of all examination results of the previous semester (Refer to Table1).

3 RESULTS

Relevant sample descriptions: 175 of the students were female, and 568 were male (one student has not indicated gender). Before attending university, 42.6% attended school in poor rural areas, 28.5% came from (socioeconomically challenging) township areas, 20.8% came from middle-class urban regions, and 8.1% attended inner city or other schools. Based on the link between socioeconomically-disadvantaged students and academic resilience, it is significant that 71.1% of students came from disadvantaged backgrounds. Students from all seven departments in the faculty of Engineering and the Built Environment were invited to participate. The majority came from Electrical Engineering (24.2%) and the least from Architecture (2.4%). These percentages are proportional to the total enrolments in departments.
As shown in Table 1, there is a strong correlation between the derived and self-reported resilience indices. Although both the derived and self-reported resilience indices correlate positively with academic performance, there is a stronger correlation between the resilience index inferred from the ten key drivers and academic achievement (0.162 at the 0.01 significance level). Individually, six of the ten drivers also correlate significantly with self-reported academic performance.

In summary, a significant positive correlation was found between academic performance and resilience as measured by the Neurozone® Brain Performance Diagnostic.

### Table 1: Pearson correlations and significance levels.

<table>
<thead>
<tr>
<th></th>
<th>Resilience index (inferred from drivers)</th>
<th>Academic performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Index</td>
<td>.826**</td>
<td>.090*</td>
</tr>
<tr>
<td>Nutrition Index</td>
<td>.415**</td>
<td>.099**</td>
</tr>
<tr>
<td>Sleep/Wake Cycle</td>
<td>.083*</td>
<td>.048</td>
</tr>
<tr>
<td>Silencing the Mind</td>
<td>.237**</td>
<td>.066</td>
</tr>
<tr>
<td>Social Safety</td>
<td>.454**</td>
<td>.189**</td>
</tr>
<tr>
<td>Goal-Directedness</td>
<td>.634**</td>
<td>.127**</td>
</tr>
<tr>
<td>Collective Creativity</td>
<td>.378**</td>
<td>.081*</td>
</tr>
<tr>
<td>Learning</td>
<td>.302**</td>
<td>.056</td>
</tr>
<tr>
<td>Abstraction</td>
<td>.274**</td>
<td>.067</td>
</tr>
<tr>
<td>Executive Function</td>
<td>.275**</td>
<td>.075</td>
</tr>
<tr>
<td>Resilience (inferred from drivers)</td>
<td>1</td>
<td>.162**</td>
</tr>
<tr>
<td>Resilience (self-reported)</td>
<td>.330**</td>
<td>.088*</td>
</tr>
<tr>
<td>Academic performance (self-reported)</td>
<td>.162**</td>
<td>1</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

### 4 CONCLUSIONS AND FUTURE WORK

Although it is accepted that many factors have an impact on student academic success, the precursors to academic efficacy, specifically resilience of the mind-body system, is often overlooked. Even more impressive, is the fact that resilience can be cultivated through various behavioral changes, often unrelated to academic activities [5]. Exercise, sleep, silencing the mind (meditation), social safety and collective creativity as defined by Neurozone®, have all been shown to enhance resilience [5]. It becomes essential then for academic institutions to facilitate the cultivation of these behaviors to increase the probability of academic success. Since the majority of students at TUT (71.1% of the sample investigated, but representative of the institution) came from disadvantaged socio-economic backgrounds, implementing systems and processes to strengthen academic resilience and the effect of protective factors, will be the focus of future work.

### ACKNOWLEDGEMENTS

This work was made possible in part by the 2018 University Capacity Development Grant (UCDG) of the Department of Higher Education and Training (DHET), the Higher Education and Support (HEDS) division at the Tshwane University of Technology and Neurozone®.
REFERENCES


