ISSUE 2

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

UNDERGRADUATE RESEARCH JOURNAL

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INTRODUCTORY LETTER

Dr. Erin Banks, Assistant Dean
Office of Undergraduate Research
University of North Carolina at Charlotte

The Office of Undergraduate Research is proud to present the second issue of the *University of North Carolina at Charlotte Undergraduate Research Journal.* The journal introduces some of the very best faculty-mentored undergraduate research and scholarship from Charlotte, North Carolina's urban research university. The creation of this undergraduate research journal adds to the strength of the university as we achieve national prominence as an emerging, top-tier research university that prides itself on research and creativity, exemplary undergraduate, graduate and professional programs, civic and community engagement and innovation.

UNC Charlotte represents the heart of the city and the university that is committed to addressing cultural, economic, educational, environmental, health and social needs of the greater Charlotte Region. Our inclusive culture, renowned faculty and future-focused environment produces future researchers who are prepared to tackle the challenges that not only face our region, but the entire world. The articles that are presented in this issue are across various colleges and disciplines and highlight topics in the arts, education, and social issues.

Congratulations to each of the scholars and faculty mentors featured in this journal as this is a culmination of a lengthy process of discovery filled with excitement. Thank you to the Office of Undergradaute Research staff, faculty and student reviewers and Atkins Library who made the publication of the *Undergraduate Research Journal* possible. I hope you enjoy and are enriched by the articles in this year's *Undergraduate Research Journal.*

Best Regards,

Erin Banks

Erin Banks, Ph.D.
Assistant Dean, Office of Undergraduate Research

MISSION

The University of North Carolina at Charlotte Undergraduate Research Journal is an open-access and peer reviewed journal of scholarly work conducted by undergraduate students. The goals of this journal are to: 1) provide a platform through which undergraduate students who conduct novel research at the University of North Carolina at Charlotte may publish their work, 2) allow students on the review board to experience the peer review process, and 3) share research that is conducted at the University of North Carolina at Charlotte with the Charlotte community and beyond. Manuscripts undergo a rigorous review process by a board of student and faculty reviewers. This journal features scholarly work from multiple disciplines.

WHAT IS UNDERGRADUATE RESEARCH?

Undergraduate research, as adopted by CUR (Council on Undergraduate Research), is a mentored investigation or creative inquiry conducted by undergraduates that seeks to make a scholarly or artistic contribution to knowledge. In addition, it is a high impact practice that greatly affects a student's academic career and success while also contributing to our society by adding to our global knowledge. Disseminating one's research findings is part of a holistic research experience, and the *University of North Carolina at Charlotte Undergraduate Research Journal* serves as a platform for students to communicate their research to the global community.

ACKNOWLEDGEMENTS

It is with great pleasure that we present the second issue of the *University of North Carolina at Charlotte Undergraduate Research Journal.* We would like to thank the Atkins Library staff for their expertise and support in producing this journal. We give special thanks to the authors who submitted their manuscripts for publication in this issue and their faculty advisors for their mentorship. We would also like to give many thanks to the editorial board and to Charlotte's faculty and student reviewers for their invaluable time and expertise.

Dr. Erin Banks
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Undergraduate Journal Editor

Leadership Alignment: Teachers' and Administrators' Perspectives within Two Schools

Department of Middle, Secondary, and K-12 Education
Tara N. Gabriel and Adriana L. Medina, Ph.D.

Abstract

Many school administrators struggle to find a reliably efficient and effective way of stabilizing academic reform implementation within educational institutions. Questionnaire responses were collected from two schools in the same district, including one administrator and four teachers from School 1 and one administrator and two teachers from School 2, with the intent of examining if teachers' and administrators' perceptions of administrative leadership align within the same school. The findings of this research study coincide with Metz. et al. (2019), concluding that educational leadership can be effectively implemented through a shared vision of the school, communication, collaboration, and supportive resources, along with humane characteristics utilized throughout those categories to create rapport and positive school culture. This study contributes to the greater

Tara N. Gabriel
Tara is a teacher candidate in the Middle Grades Education program within the Cato College of Education. She is pursuing her licensure in English Language Arts and Mathematics, along with a minor in Children's literature and Childhood Studies. Her academic interests involve scholarly research in the field of education (i.e., leadership, school administration, social justice pedagogy) and learning about cultural competency by engaging with diverse individuals. She appreciates spending quality time with others, including acquaintances, friends, and family. She enjoys participating in social events and attending entertainment-based activities. Her continuous goal in life is to build community around shared human experiences and make meaningful connections with others to promote individualgrowth.

Adriana L. Medina, Ph.D.
Dr. Adriana Medina is an Associate Professor of Reading Education in the Cato College of Education. She teaches courses in language arts, reading comprehension, reading assessment and intervention, content area literacy, teaching reading to English language learners, mindfulness and education, identity through art, communication and critical thinking, and multicultural and global education. Dr. Medina's research interests include students who struggle with literacy, teacher education, global learning, the impact of study abroad on preservice teachers, and educational program evaluation. Dr. Medina has contributed to several textbooks and articles with regards to her areas of interest. Dr. Medina is the co-author of the text *Studying World Languages: An Interactive Guidebook.*

understanding between academic structures of top-down leadership and transformational leadership. Limitations include the small sample size, short time frame of the study, and only middle school representation. The main finding is that distributing responsibilities gives schools a greater chance to cultivate school-wide academic and social change.

Keywords: school leadership, transformational leadership, school climate, school culture

Leadership Alignment: Teachers' and Administrators' Perspectives within Two Schools

Academic leadership ultimately affects students, teachers, and school administrators. Although the span of academic leadership ranges from national and state levels to the classroom, often the onus of academic leadership falls on school leaders. School administrators struggle to find a reliably efficient and effective way of stabilizing academic reform implementation within educational institutions (Anderson, 2017; Cooke, 1985; Ravitz, 2010). Various methods of applying personal leadership techniques, attributes, and skills can help school administrators promote and sustain school reform (Cooke, 1985; Fullan, 2014; Heck et al., 1990; Lowenhaupt & McNeill, 2019). Teachers tend to collaborate infrequently, requiring supervision and guidance from more organized leaders who possess leadership attributes and skills (Cooke, 1985; Lowenhaupt & McNeill, 2019). Administrators need to know how to better lead and provide resources for their teachers and students across various school cultures and developmental transitions (Anderson, 2017; Atasoy, 2020; Fullan, 2014; Lowenhaupt & McNeill, 2019; Ravitz, 2010). It is beneficial for a leader to possess leadership characteristics and skills *and* use them to collaborate as a team and share responsibilities to successfully implement change (Cooke, 1985; Klar, 2013). Personal leadership characteristics, along with leadership management style, influence school team commitment, preparation, and positive student outcomes (Anderson, 2017; Cooke, 1985). There is a lack of research in middle school leadership, specifically regarding transformative leadership practices; thus, the purpose of the study is to examine how middle school administrators and teachers perceive leadership.

Literature Review

Leadership is the ability to guide and support others through a distinct, commonly agreed upon, action plan (Atasoy, 2020). Fullan (2014) distinguished principals as "lead learners" who initiate change while others work alongside them to ensure goals for students and the school are performed with purpose and proficiency (p. 55). Leadership attributes such as establishing authority, team building, awareness of school climate and community changes, and encouraging school reform, can help school faculty lead with an open-mind while adapting to changes (Desimone, 2002).

Leadership Styles Defined

Leadership effectiveness on fostering school change has been split between instructional/transactional leadership (Ishimaru, 2012; Heck et al., 1990; Leithwood, 1994; Lowenhaupt & McNeill, 2019) and transformational leadership (Anderson, 2017; Desimone, 2002; Ishimaru, 2012; Metz. et al, 2019). According to Leithwood (1994) instructional/transactional leadership tries to initiate school-wide reform through principal control in classroom settings. Top-down traditional leadership practice—where administrators micromanage teachers, who are actually responsible for implementing reform tasks—becomes idealized as a "heroic" position (Ishimaru, 2012, p. 6). Although instructional leadership has shown to positively influence student achievement (Heck et al., 1990; Lowenhaupt & McNeill, 2019), the goal of school reform has recently transitioned to initiating whole-school and community change starting from all stakeholders.

On the other hand, transformational leadership tackles reform processes by distributing responsibility to multiple people (Metz et al., 2019). Similar terms associated with this theory include distributive leadership, shared educational leadership, shared power, and group-level leadership. Metz et al. (2019) concluded principals claimed to be transformational leaders, who valued humane qualities, communication, collaboration, shared vision, and supporting the growth of others. Anderson's (2017) definition of transformational leadership, states "[t]ransformational leadership is characterized by a leader who collaborates with subordinates to identify needed change, creates a vision to guide the change through inspiration, and executes the change in unison with committed members of a group" (p. 1). Sharing power goes beyond principals, district administrators, and even teachers; it incorporates community background acknowledgement and parent involvement (Desimone, 2002; Ishimaru, 2012).

Sharing Leadership Responsibilities

Transformational leadership has shown to influence school culture in predicting school-wide reform, incorporating parent and community input, and encouraging change in contextually diverse settings. School culture can be a predictor of how effective school-wide organizational reform will be

implemented. Atasoy's (2020) research suggested transformational leadership has a greater positive effect on teachers and the progression of a positive learning environment. Additionally, transformational leadership style holds potential to reduce negative behaviors, such as an uncontrollable power dynamic between administrators and teachers; therefore, providing opportunity for school-wide change to progress (Atasoy, 2020).

Distributing leadership responsibilities to a team of administrators, teachers, parents, and/or community members can support the development of school reform and student achievement. Along with initiating change within institutions, roles might need to be reevaluated, refined, and/or redefined to stabilize structural leadership and a collective contribution from all persons (Klar, 2013). Distributive leadership could expand from (or go beyond) a School Improvement Team, a group of individuals who work to implement the School Improvement Plan, and administrators (Ishimaru, 2013; Klar, 2013). Shared educational leadership has the potential to reach parents and the surrounding community, encouraging stabilized reform and overall student success. Emphasizing team-based leadership between administrators, educators and community, can foster multiple relationships that sustain change in schools. Leadership skills can extend outside implementation of personal impacts from school leaders, and into instruction and curriculum reform in differing settings. Cravens (2014) condoned the belief that there are general commonalities between a school-wide leadership approach and cross-cultural educational goal of supporting student learning. Researching culturally diverse contexts across various school settings, gathers contextually-based data to demonstrate the effectiveness of change implementation when all school leaders share a common goal.

Organizational Reform

Comprehensive School-wide Reform (CSR)

Comprehensive School-wide Reform (CSR) is a common organizational strategy that supports the usage of transformational leadership in schools. Comprehensive School-wide Reform, referred to as the potential third wave of school reform, considers the whole school when making improvements that

affect all aspects of the school, including school culture, climate, and improvements in academics and curriculum (Desimone, 2002). According to Klar and Brewer (2013), CSR initiated an increase in student achievement at each school and advised school leaders to institutionalize this practice to effectively progress holistic school reform implementation. Holistic school change is becoming accepted by multiple school districts and encouraged by school administrators (Desimone, 2002). Klar and Brewer (2013) also signify how school-wide reform leadership must be adapted to specific school contexts to support, promote, stabilize, and even enhance school culture, climate, and academics.

School Culture & Climate

How school faculty work together, communicate, and impact students, otherwise known as school culture, ultimately plays a significant role in how educational reform is implemented and sustained (Atasoy, 2020). School climate, identified as students, faculty, parents and surrounding community members, also contributes to the school's demographics (i.e., socioeconomic status, population, school size) (Ishimaru, 2012; Klar, 2013; Klar & Brewer, 2013; McCommons, 2014; Ravitz, 2010). Schools with high-poverty communities, high-needs or even high-performing schools must be aware of their school context, culture, and climate to enact leadership techniques used to implement organizational change. Urban school resources, populations, and educator and community involvement compared to rural locations have an effect on reform approaches (Klar, 2013; Lowenhaupt & McNeill, 2019; Ravitz, 2010). Smaller schools, as well as startup schools, have an advantage when implementing strategic change because of the smaller faculty and student population, and typically, more parent and community involvement (Ravitz, 2010). In addition, schools in rural districts possibly have more struggles obtaining resources and experience challenges implementing reform (Lowenhaupt & McNeill, 2019). With the acknowledgement of external factors influencing internal aspects of educational institutions, school leaders can understand how the school climate affects the success of reform implementation.

Outside School Influences

The surrounding school community involvement can influence the rate at which implementing reform occurs *and* its effectiveness. Klar (2013) and Ravitz (2010) recognized a collaborative effort between school administrators, teachers, and parents/community members is more effective in implementing school-wide reform. However, encouragement and persistence, or the lack thereof, from community/parents depends on if school-wide reform movements initiate and mobilize (Ishimaru, 2013). Ravitz (2010) examined schools in various locations and populations including comprehensive schools, "schools that had converted to small learning communities," and "small school start-up[s]," concluding school demographics can make it easier or harder to further school-wide reform (p. 290). The author also identified a positive teacher culture and effective instructional change in smaller schools than in larger comprehensive schools (Ravitz, 2010). Thus, outside school factors, such as community and parent involvement, can influence the outcome of organizational change efforts.

To summarize, major components of implementing efficient and effective school reform include shared leadership responsibilities, school-wide reform, and positive school culture. School leaders have been moving toward transformational leadership as they implement comprehensive school-wide reform while also considering their specific school culture, school climate, and community factors. Metz. et al. explain how the categories of transformational leadership align with impactful outcomes of progressive school change. The purpose of this study was to understand educational leadership in relation to reform efforts by examining how middle school administrators and teachers perceive their school leadership. The following research question guided this study: How do teachers' and administrators' perceptions of leadership practices align within the same school?

Methods

A qualitative research design and Transformational Leadership Theory framework was applied to understand how school administrators establish change in schools and how teachers perceive leadership within their own school.

Setting and Participants

Schools were purposefully criterion sampled based on 2019 report cards from the state's public records; however, participants voluntarily responded to the questionnaire. This study took place within two suburban 6-8 grade middle schools, within the same school district, in a Southeastern regional state of the U.S. The schools mirror the demographics of the district: School 1: 65% White, 12% African American, 15% Hispanic; School 2: 23% White, 28% African American, 42% Hispanic. A total of two school administrators and six teachers participated in the study (see Table 1). Institutional review board permission was obtained for this research study.

Table 1

*Participant Demographics**

School	Teacher/Administrator	Years of Experience	Duration at School	Highest Degree
School 1	Administrator 1	8	--	Doctorate
	Teacher A	--	3 years	--
	Teacher B	--	3 years	--
	Teacher C	--	6 years	--
	Teacher D	--	9 weeks	--
School 2	Administrator 2	11	--	Masters
	Teacher E	--	1.5 years	--
	Teacher F	--	3 years	--

* Note: This table depicts self-reported data asked within the questionnaire.

Data Sources

Data were collected through a constructed questionnaire based on the review of existing literature above (see Appendix A and B). The goal of the open-ended administrator questionnaire was to identify (a) their leadership style and attributes, (b) how change is implemented (i.e., socially, through commu-

nity, and academically), and (c) how often they collaborate with other faculty members. The goal of the partially open-ended and Likert-style teacher questionnaire was to understand (a) how teachers define and perceive leadership, (b) what teachers do to influence school-wide reform, and (c) the level of satisfaction related to the support teachers feel they receive from their administrators and school staff.

Data Analysis

While representing an interpretive epistemological perspective (Saldaña, 2011), a comparative analysis of all data sources was employed to determine commonalities and differences between collected data. The researchers developed short analytic memos to identify findings, comparative patterns, and evident themes between raw data and a priori theoretical categories, supporting the evidence for creating a code to eventually place into a category (Saldaña, 2011). Codes, quotes and corresponding information were stored in a digital codebook. The researchers discussed the findings and interpretations that emerged and came to consensus. Data was triangulated by a review of publicly available school and district documents (i.e., school improvement plans and 2019 district school report cards) describing how curriculum instruction and academic reform was implemented at each school.

Findings

As previously mentioned, Metz et al. (2019) identifies five categories of transformational leadership: humane characteristics, communication, collaboration, shared vision, and supporting the growth of others. The main findings of this study align with Metz. et al.'s (2019) core categories. Thus, the findings are presented within the same bounds of the categories to demonstrate how school administrators and teachers structure their school environment to benefit the efforts toward school improvements.

Definition of Leadership

As part of the questionnaire, both administrators and teachers were asked to define the term leader. All teachers defined a leader as one who "guides" or "helps others" either work toward an individual goal or a collective goal. A couple of teachers indicated "team player," "organizer," and "communicator" as qualities of a leader. One teacher felt a leader "sets the vision" and supports execution of that vision.

Another teacher defined a leader as one who "takes responsibility for their actions." One administrator's definition of a leader aligned with the teachers' ideas of a person who "facilitates" a goal for the group. While the other administrator identified facilitating as a leadership action, his/her definition also included the methods by which a leader facilitates, guides, or helps, that is, "by teaching, learning, conflict management and problem solving."

When examined at the school level, School 1 teachers gave definitions of leadership qualities that fell under Metz et al.'s (2019) categories: humane characteristics, communication, collaboration, shared vision, and support for the growth of others. The administrator's definition of leadership only included two of Metz et al.'s categories, that is, humane characteristics and support for the growth of others. In School 2, teachers also gave definitions of leadership qualities aligning with Metz et al.'s categories. The administrator's definition included all of Metz et al.'s five categories except *shared vision*.

Communication

Both teachers and administrators were asked to address leadership communication styles. In School 1, the administrator mentioned using various large and small group meetings (i.e., SIP meetings, department meetings, and PLCs) as methods to communicate with school staff about school change. Both teachers in this school indicated they were satisfied with the amount and type of communication. In School 2, the administrator indicated they used frequent meetings in smaller settings. They indicated they "find more success in starting changes" when meeting with grade levels and departments rather than whole staff meetings. The majority of the teachers in School 2 were not completely satisfied with the form and frequency of communication.

Implementing Change

In response to the question of how participants communicate with regards to implementing change in the school structure, overall, four teachers indicated they would use direct communication such as "talking in person" with or directly emailing the administration. Every teacher in School 2 mentioned using direct communication. In contrast, the administrators at each school indicated commu-

nication with smaller groups, such as the School Improvement Team, "influential members of the staff," or "teachers or staff that are part of the initiative," is how they would communicate to implement change. Only one teacher agreed with the method of communication to a small group, or a "delegation."

Collaboration with Community

Participants were asked about how the community influences school change. In School 1, the administrator acknowledged the importance of the community. They indicated there was "a lot of community history, several generations of families have gone to school there." Due to the strong generational continuity, the administrator noticed "there have not been any radical changes" at the school over the years. The teachers indicate they would like parental and student involvement and more communication to families. In School 2, the administrator believes the community's influence should be embedded into school changes. Two teachers' responses aligned with the administrator's ideas because they teach with a focus on local issues and community events. One other teacher felt the School Board influenced the school's changes.

Shared Vision

Participants were asked how the school vision and mission was disseminated and enacted within the school and in the community. In School 1, there was alignment in responses regarding how the school's vision and mission are communicated and implemented. The administrator indicated the vision and mission was "discussed monthly" by the School Improvement Team and "weekly in PLCs," and they are "one team with one goal and no excuses." Teachers indicated the vision and mission needed to be implemented by all leaders, and another teacher stated, "I make sure to do my part."

In School 2, the administrator indicated the school's vision and mission "are incorporated in everything [they] do—mentioned in staff meetings, recited in announcements." They also have a "dedicated person" for implementing the vision and mission. However, the teachers did not mention these regular practices, they mentioned "several times a year" they revisit the mission and vision statements. Yet, one teacher, who was new to the school, said, "I am not sure of the school's vision or mission."

School Improvement Plan (SIP)

The SIP is a document reflecting the school's vision and mission in collaboration with the school and local community. In School 1, there was alignment in responses about how the SIP is communicated in curriculum and instruction. The administrator indicated teachers have goals similar to the SIP. The teachers said they make goals aligning with the school goals. One teacher includes these goals in her daily lesson plans. In School 2, the administrator holds monthly SIP meetings and embeds the SIP goals into their personal development plans (PDP). Teachers at this school followed the administrator's example and they embedded the SIP goals in their PDP as well as in their lessons. One teacher questioned whether the SIP applied "to the students [they taught]."

Supporting Others' Growth Through Resources

Both teachers and administrators were asked about the resources available for school change. In School 1, the administrator indicated "early release professional development days" and staff meetings (e.g. grade level meetings) as a resource and support to implement school structural changes. One teacher indicated being dissatisfied and one teacher indicated being satisfied with accessible resources. However, when looking at educational training to further professional development, both teachers at School 1 were satisfied. It seems "accessible resources" for school change might mean something different to teachers and administrators.

In School 2, the administrator said he/she had "monthly and weekly meetings." The teachers' feelings of satisfaction varied greatly from dissatisfied to satisfied. With regards to educational training, teachers felt either neutral or satisfied with the professional development offered to them. It seems the resources administration offers are insufficient in meeting all the teachers' needs.

As can be seen in Table 2, the data concluded the average frequency of communication was lower, rather than the same as or higher, than the satisfactory rating of administrative support. Both administrators gave insight to this statistic, stating their form of support and resources are professional development sessions/training. Teachers seemed satisfied with educational training.

Table 2

Percentage of Satisfaction: Teacher Questionnaire Responses

	Dissatisfied	Neutral	Satisfied
Administrative Support	16.67%	16.67%	66.67%
Available Resources	33.33%	16.67%	50%
Educational Training	0%	33.33%	66.67%
Frequency of Communication	16.67%	33.33%	50%

Note. The questionnaire items originated on a 5-point Likert scale (Strongly Dissatisfied to Strongly Satisfied); however, the researcher did not notice a significant difference in responses between the strongly dissatisfied and dissatisfied and strongly satisfied and satisfied; therefore the data is shown as a three point-scale (Dissatisfied, Neutral, and Satisfied).

Discussion

The transformational leadership categories from Metz et. al.'s (2019) study aligned with the findings in this study. There was a common theme of wanting humane leadership characteristics in a leader, collaboration and communication between all individuals, and shared leadership practices between school faculty and the community. At the middle school level, the categories are all intertwined which calls for delegation of leadership responsibilities between administrators, teachers and community partners. Each of the categories contributes to the acknowledgement of school-wide and community culture, in hope of developing a stronger relationship to create a larger impact through school changes.

Leading with Common Language

Administrators defined leaders as "facilitators;" however, teachers noted a leader as an individual who mainly "coaches," supports through guidance, and can ultimately delegate tasks while still doing their part. Teachers and administrators do not seem to be using the same terminology around leadership; thus, it makes it difficult for school change to occur. School culture should be based around a common language, understood and accepted by all individuals. A transformational leadership style would encour-

age administrators and teachers to communicate, collaborate, and disperse tasks evenly. Cooke (1985) also emphasized how personal leadership traits (including supportive and humane) can advance the distribution process of responsibilities to many levels of school and community members, strengthening the effectiveness of school reform.

Communication

Teacher and administrator communication is shown to be inconsistent, with uncoordinated messaging methods. At each school, the administrators apply different methods of verbal and written dissemination - small group, department, whole school, and community—sometimes via email; therefore, the effectiveness of change is static. Distributive leadership can be obtained with consistent communication of changes. Whether from the principal, other administrative staff, parents, and/or School Improvement Team (SIT), change is more likely to occur efficiently and effectively if all parties are aware of what is happening and can be part of the planning and implementation process (Cooke, 1985; Desimone, 2002; Ishimaru, 2012). Although all members have influential impacts, it is imperative principals and other school administration professionals be receptive to staff members' and the community's needs.

Working with large and small groups inconsistently can be detrimental to a transformational leadership practice. However, solely working with smaller groups can increase the changes in incremental measures. Ravitz's (2010) findings on smaller school implementation effectiveness also correlates with small group implementation (i.e., starting at a grade level or department, small group interventions). When the school population is smaller, there is a higher success rate of imploring a distributive leadership approach, because the number of staff and students are reduced (Ravitz, 2010). Starting small to create a larger impact is a sustainable practice when looking to organize reform in school settings.

Collaboration

The findings on community influences were similar between administrator and teacher responses, stating the surrounding school community should be more informed, participate in school reform movements, and should be considered before making school changes (especially those that directly affect the

community). Teachers stated they include "local ideas" and events in the community into their teaching practices (Teacher D, Teacher E). Administrator 2 believed the "community should influence school decisions…such as community values, aspirations, principles, etc." Whether there is a strong sense of community input or not, the data urges for further support from the surrounding school community.

Shared vision

The idea of a vision or mission to instill school-wide reform found in the data is congruent with Anderson's (2017) definition of transformational leadership; the administrators and teachers agree a leader is one that works with others to create and executive a vision. Although the schools in this research study do not claim to be transformative schools, it is clear teachers desire transformative school characteristics—considering various school community inputs that advance reform processes. Through the perceptual lens of transformational leadership theory, comprehensive school-wide reform becomes feasible in practice if all individuals apply a shared mission centered around a growth-mindset and engage in productive collaboration.

Limitations

The limitations include being a small sample size, short time span, and only two middle schools. Unfortunately, only six teachers responded to the questionnaire within the bounds of this study being conducted within one month. If the research extended for a longer time period, there is a possibility the voluntary questionnaire would have attracted more recipients. School culture and school climate are difficult factors to navigate (Atasoy, 2020; Heck at al., 1990); however, internal and external school relationships, although taken into consideration when developing the questionnaire, are uncontrollable factors. Furthermore, this study's lens was under the scope of only middle schools; thus, elementary and high school levels were not represented, and future research should aim to overcome this limitation.

Conclusion

The findings of this research study conclude that educational leadership can be effectively implemented through a shared vision of the school, communication, collaboration, and supportive resources,

along with humane characteristics utilized throughout those categories to create rapport and positive school culture. The common themes between all data were related to properly facilitating accessible resources (i.e., training, PLC, School Improvement Team) *and* engaging with the community and school faculty in a meaningful manner. School administrators and teachers can practice co-leadership efforts to initiate and sustain growth of a school culture and climate. Allowing a shared vision to be achieved by multiple people who distribute responsibilities demonstrates efficiency in accomplishing school-wide reform greatly impacting both faculty, students, and the greater community.

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APPENDIX A

Administrator Questionnaire

Personal Background

1. What are the initials of the school where you currently teach? (e.g., Wolf Heights Middle School would be WHMS)
2. What is your educational background? (i.e., Degrees, Licensure, Certificates, etc.)
3. How many years of experience do you have as a principal/administrator/school leader?

Perspective of Leadership

1. In your own words, define the term Leader.
2. What do you consider to be important characteristics of a leader?
3. How has your experience as a principal/administrator shaped you as a leader?
4. How do you go about implementing school structure changes such as using a new curriculum, enforcing school social norms, creating a positive school culture, etc.?
5. What methods of communication (i.e., hold staff meetings, in-person conversations, one-on-one meetings, exchange information through email, etc.) do you use to interact with school staff when discussing implementation of school change?
6. How do you ensure the school's shared vision or mission is communicated to the school community?
7. How is the school's shared vision or mission being effectively implemented?
8. What supports and/or resources do you provide to teachers when implementing school structure changes? For example, do you hold professional/leadership development days and/or routinely scheduled staff meetings?
9. How do you address the School Improvement Plan objectives as the school principal/administrator?
10. What training have you had to implement school-wide changes in organizational reform?

Leadership Culture

1. What elements of the surrounding community influence the way you implement school change?
2. How do you acknowledge the school's culture to implement school-wide change?

APPENDIX B

Teacher Questionnaire

Perspective of Leadership

1. In your own words define the term Leader.
2. What do you consider to be important characteristics of a leader?

Collaboration

1. How do you communicate with administration when supporting implementation of school-wide changes such as initiating a new curriculum, initiating different ways of instruction, enforcing your school's social norms (i.e., respect, responsibility, accountability, punctuality), and/or creating a positive school culture?
2. How do you ensure the school's shared vision or mission is being effectively performed?
3. How do you incorporate the School Improvement Plan objectives into your curriculum and instructional techniques?

Closed Questions: Levels of Satisfaction

1=Strongly Dissatisfied, 2=Dissatisfied, 3=Neutral, 4=Satisfied, 5=Strongly Satisfied

"How satisfied are you...."

1. With the amount of support the administration team at your school provides when enacting school change?

2. With the types of resources accessible to you used to implement school changes?

3. With educational training available to you to further your professional development?

4. With the amount of communication from your principal regarding school reform?

Personal Knowledge

1. What are the initials of the school where you currently teach? (e.g., Wolf Heights Middle School would be WHMS)
2. How long have you been teaching at your current school?
3. How involved are you in the school community?
4. What elements of the surrounding community influence the way you implement school changes?

Examining the Social and Emotional Consequences of the Inequity of Access to Gifted Programs: A Study Using PRISMA Methods

The Department of of Reading and Elementary Education
Canaan Eident, Michael Matthews, Ph.D., Cindy Gilson, Ph.D., and Erik Byker, Ph.D.

Abstract

The purpose of this study was to examine the social and emotional consequences of the inequity of access to gifted programs in the United States' school system. To complete this study, we used a modified version of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method to conduct a systematic review about the following research questions: What are the social and emotional impacts of gifted programs? What are the positive social and emotional impacts of gifted programs? What are the negative impacts of gifted programs, especially for students who are *not* in the programs? Both quantitative and qualitative studies were included, as well as peer reviewed scholarly articles relating to consequences of the gifted program. The findings from five research studies included negative social and emotional consequences of gifted programs. Research indicates that there is inequity in

Canaan Eident

Canaan Eident is a member of the Education Honors Program as a 4th year Elementary Education major with a minor in Children's Literature. She has always had a passion for children and equity-based instruction and her research on the social and emotional consequences of the gifted program solidified this interest. Hoping to pursue a career as a lower elementary teacher after she graduates, Canaan wants to use her research to help work towards more inclusive, fair, and equitable gifted admissions processes.

Michael S. Matthews, PhD,

Michael S. Matthews, PhD, is professor and graduate program director at the University of North Carolina at Charlotte. He is Co-Editor of *Gifted Child Quarterly* and an active member of the SIG—Research on Giftedness, Creativity, and Talent of the American Educational Research Association. Dr. Matthews has served on the boards of several local, state, and national organizations in gifted education. His research addresses equity in assessment and identification of gifted children; education policy; motivation and underachievement; and parenting, including homeschooling, of gifted learners. His scholarship also focuses on gifted and academically advanced learners who are English learners. He is author or editor of six books, approximately 50 peer-reviewed journal articles, and numerous book chapters. His work has been recognized with the AERA's Michael Pyryt Collaboration Award, the 2020 Distinguished Service Award from the North Carolina Association for the Gifted & Talented, and Best Scholarly Book from the Texas Association for the Gifted & Talented.

access for students of color. Furthermore, research shows that students in gifted programs experience perfectionistic tendencies. Students excluded from gifted programs experience an elitist environment and lower self esteem. In addition to negative consequences, there were also positive aspects of the access and opportunities for selection into gifted programs including an elevated motivation in gifted students and heightened time management skills from the increased rigor in coursework.

Keywords: social and emotional, consequences, gifted program, elitism, underrepresentation, student and teacher perceptions

Cindy M. Gilson, Ph.D.

Dr. Cindy M. Gilson is an Associate Professor of Gifted Education at the University of North Carolina at Charlotte. She is also the Director for the Graduate Certificate in AIG (Academically or Intellectually Gifted) Program and Co-Director for the Honors in Education Program. Her professional and research interests include differentiated curriculum and instruction for gifted students, enhancing rigorous classroom discourse, and differentiated professional learning.

Examining the Social and Emotional Consequences of the Inequity of Access to Gifted Programs: A Study Using PRISMA Methods

"Gifted" is a term used to describe students who have the capability to perform at higher levels compared to their peers of the same age (NAGC, n.d.). Students who are deemed gifted through intelligence testing are eligible to be admitted to a gifted program, which typically uses an adapted curriculum to challenge the students in both regular classroom settings and/or additional programs, pull-out, or self-contained programs (NAGC, n.d). During the analysis of gifted programs, there have been many potential social and emotional negative consequences noted that could pose issues to the academic performance of students both in the program and not in the program. The purpose of this article is not to discredit gifted programs— as many students benefit from them (Berlin, 2009) — but to inquire on prevalent issues within the gifted education system that include an overly exclusive nomination process (McBee et al., 2016) and extreme underidentification of students of color (Peters et al., 2019). Numerous unjust flaws with the gifted program are significant because of the continual underidentification of certain student groups, and how this perpetuates unequal access to resources and opportunities. Perfectionism in gifted students (Callard-Szulgit, 2012) and feelings of elitism (Hujar, 2021) are also common social and emotional problems within the system.

The research questions that guided the inquiry were: What are the social and emotional aspects of gifted programs? What are the positive social and emotional aspects of gifted programs? What are the negative aspects of gifted programs especially for students who are *not* in the programs? The PRISMA method was used to complete a systematic review based on select articles about the effects of the gifted education program on students' social and emotional well-being. The article is organized into four sec-

Erik Byker, Ph.D.

Dr. Erik Jon Byker is an associate professor in the Cato College of Education and an Honors College faculty at UNC Charlotte. He is a Faculty Fellow in the Office of Undergraduate Research and chairperson of UNC Charlotte's Undergraduate Research Conference (URC). He teaches classes on instructional design, research methods, social studies methods, and the Sustainable Development Goals. He conducts comparative and international research and field studies about educational technology, global competencies, and study abroad in locations like Cuba, England, Germany, India, South Africa, South Korea, and across the United States.

tions: background, method, findings, and discussion.

Background

The selection process of gifted programs has many social and emotional consequences for students and researchers have reported a lack of inclusiveness of these programs. For example, there are exclusive criteria that are often written into this selection process related to race, ethnicity, alternative abilities, or income. These issues often may be detrimental to the students' ability to perform to the best of their ability on school assignments (Peters et al., 2019).

Lack of Opportunity

Researchers have also reported a lack of opportunity. For example, Moon (2002) conducted a qualitative analysis of the students' and teachers' perceptions of the influences of state testing mandates on curricula and student motivation. Moon (2002) found that state testing mandates, which are often used as part of gifted program selection, do not provide an accurate depiction of a student's intellectual abilities because of potential poor test taking abilities and anxiety. The outcome of this testing often decreases the likelihood of students being identified for a gifted program. McBee et al. (2016) used a quantitative analysis of mathematical simulations to describe the variables and the likelihood of students getting accepted into the gifted program. According to McBee et al. (2016), the nomination process greatly affected students throughout the course of their school lives. By requiring a nomination stage prior to admission, schools likely cause the false negative gifted rate to increase. This also happens when teachers do not nominate potentially gifted students for screening, which results in a significant number of students who may be qualified not being considered for the gifted program.

Underrepresentation

Researchers have also reported the underrepresentation of students of color in gifted programs. According to a quantitative study by Peters et al. (2019), the gifted and talented system is unjust in ways that lead to a consistent pattern of White and Asian students being accepted into the gifted program considerably more than African American and Latinx students. White and Asian students

should not be excluded from programs due to overrepresentation if they qualify for services, rather identification practices must be changed to more equitably represent other groups of students. Family income levels also relate to underrepresentation. For example, Cross (2005) reported that the funding for gifted programs in school in low socioeconomic status (SES) neighborhoods is often very low or nonexistent.

Elitism

One researcher found evidence that identification for gifted students led to an attitude of elitism among the students. Hujar (2021) found in her qualitative study that both gifted students and those not identified as gifted reported a general perception in their schools that gifted students thought of themselves as above other students. Non-identified students in the study indicated lower-self esteem than their peers in gifted education programs.

Positive Effects

While there were a number of researchers reporting evidence of the lack of inclusivity of the gifted program, we noted that there was also literature indicating positive social and emotional benefits to gifted programs. Berlin (2009) found that a majority of the gifted students felt less bored and more excited about school because of the friends that they found in the program. Hujar (2021) found that gifted programs provided increased opportunities for enrichment including field trips and interesting projects.

There are gifted program admissions practices that are designed specifically to be inclusive, such as the Schoolwide Enrichment Model (SEM), which aims to cast a "wider net." According to Reis and Peters (2021), SEM is a model of practice used in many schools that aims to give more opportunities for admission into the gifted program by expanding the definition of gifted. SEM uses an expanded identification criteria and process by constructing learning experiences to fit students' interests and strengths, instead of the common standards. It allows students to understand that there are many ways you can be gifted. While there are positive effects of gifted programs and more inclu-

sive programs like SEM, the patterns of underrepresentation, elitism within the school environment, and selective nomination processes cause a difficulty in finding a true representation of gifted students and can have a detrimental social and emotional impact on students not identified as gifted and talented. In sum, Hujar (2021) explained these patterns often make students feel like they are "less than" other students and even lessen their motivation in school. In light of this background information and lack of a comprehensive screening of the literature on this issue, we had three research questions that guided our study:

RQ1- What are the social and emotional aspects of gifted programs?

RQ2- What are the positive social and emotional aspects of gifted programs?

RQ3- What are the negative aspects of gifted programs especially for students that are *not* in the programs?

Method

To answer these research questions, we completed a systematic review. We used a modified version of the PRISMA method to systematically select articles about aspects of gifted education programs. According to Moher et al. (2009), "A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review" (p. 1). Applying the PRISMA method, we screened 22 articles, then analyzed five of these research articles in this study. We used these articles to answer the research questions and to draw conclusions about the social and emotional aspects of gifted education.

Keywords

To find candidate articles, we searched ProQuest, ERIC, and Google Scholar using a combination of the keywords: academically gifted, student perceptions, social-emotional, perfectionism, elitism, non-gifted, social bias, exclusive, gifted and talented program, non-gifted

students, perceptions, test anxiety, underrepresentation, and minority.

Inclusion Criteria

The inclusion criteria for this study was that the research articles must be about gifted education programs and specifically related to student or teacher perceptions, in order to provide first hand qualitative insight to these programs' social and emotional impacts. This included underrepresentation of students of color in the program, perfectionism in gifted students, the effects of the exclusive nomination process on students, and the feeling of elitism in school settings. Most of the articles were within the past 10 years to ensure the data was up to date. We also limited our selection of articles to peer reviewed scholarly articles for accuracy and reliability. We excluded articles that were not related to the social and emotional outcomes of students in gifted programs. Table 1 shows the organization of our search for candidate studies.

Table 1.

Online Academic Databates Search Results

Author (Date)	Keywords	Search date	Theme
Kitsantas (2017)	Academically gifted (DE); student perceptions, social emotional	9-13-2021	The student perceptions of social-emotional functioning and academic.
Harradine at. al (2013)	Academically gifted (DE); student perceptions	9-13-2021	Overlooked potential in students of color and the relationships between teacher race and barriers to recognizing potential.
Margot and Rinn (2016)	Academically gifted (DE); Perfectionism	9-18-2021	The student's perfectionism tendenceis related to concerns over mistakes, parental expectations, personal standards, and organization.

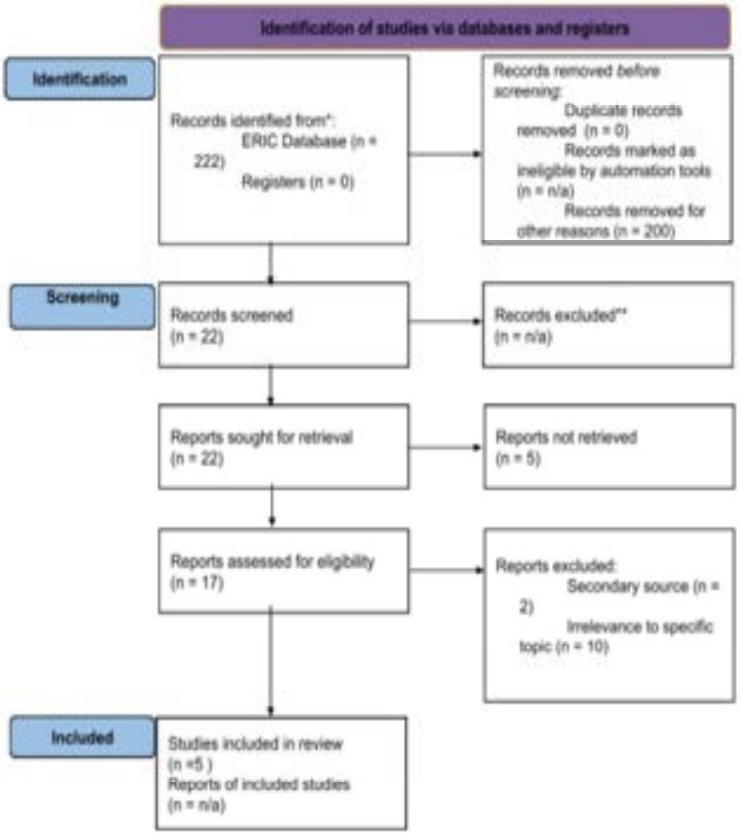
Mofield and Peters (2015)	Academically gifted (DE); Perfectionism	9-18-2021	Healthy vs unhealthy perfectionism and the prevalence of overexcitabilities in relation to perfectionism.
Gallagher et al. (2016)	Elitism, gifted	10-21-2021	Teacher perceptions on forms of ability grouping and acceleration. Teachers were more in favor of part time vs full time.

Note: Search period was between 9-13-2021 and 10-21-2021 and data was collected from one database, ERIC.

PRISMA Method

According to Moher et al. (2009), PRISMA is a systematic method for conducting literature reviews and meta-analysis. Flow charts can be a useful tool for illustrating the PRISMA method. For example, Figure 1 shows a PRISMA Flow Diagram of our systematic investigation of the research questions. The PRISMA Method includes searching and screening candidate studies for review. We initially identified 222 articles from the ERIC database during an initial search. Of those 222 articles, we removed 200 articles due to irrelevance of the topic before screening. We then screened the 22 remaining articles and sought all of them for retrieval. Five of these articles were excluded due to inability to retrieve, such as the retrieval link being inaccessible, leaving 17 that were to be assessed for eligibility. During the assessment of these articles, two were excluded due to being secondary sources and 10 were excluded due to the irrelevance of each article's content and lack of connection to the research questions. Five articles were remaining and used for this review.

Figure 1.
PRISMA Flow Diagram



Data Analysis

The PRISMA method also includes data analysis. After finding the candidate studies, we used a three-step interpretive approach to data analysis (Miles & Huberman, 1994). This included the first step of reading through all the articles. The second step included identifying categories and codes related to the repeated words and ideas in the articles. The third step of interpretive data analysis involves combining and summarizing the categories and codes into themes based upon commonalities. Through these three steps of data analysis, we developed themes to answer the study's research questions.

Findings

We answered our research questions by organizing our findings based on the themes captured from our data analysis. First, we report on the positive aspects of gifted programs. Next, we discuss the negative aspects of the access and opportunities related to gifted programs for students who are in gifted programs and for those who are not in gifted programs.

Positive Aspects

The literature (i.e., five included articles) included one article about the positive aspects related to gifted programs including the increased enjoyment of learning and motivation to learn amongst the students (Kitsantas, et al., 2017). Researchers have also found another aspect of gifted programs was increased time management skills and the increased enjoyment of school. According to Kitsantas et al. (2017), a student interviewed for their study stated, "You can't procrastinate. My procrastination has had to lessen—especially because I do extracurricular activities." A third student indicated that the gifted program helps them to "keep track of assignments" (p. 14). The students in the study expressed interest in their ability to learn more in the gifted program than when they were in the general education classroom. This increased motivation allows students in the gifted program to work harder in school and receive better grades.

Equity and Access

The lack of equity and access to gifted programs among underrepresented students of color was found in the literature, however one source gave a positive outlook (Harradine et al., 2014). Harradine et al. (2014) concluded that using a specific form for teachers to complete before identifying students as gifted was imperative for a more anti-bias approach to identification. This form was called a Teacher's Observation of Potential in Students (TOPS) survey. It assesses the teacher's ability to decipher behavioral indicators for gifted potential in students. These behavioral indicators are said to oftentimes be "non-teacher-pleasing" behaviors, such as being argumentative, distracting classmates, or asking too many questions. The TOPS survey's aim is to allow teachers to take a second look at students who

exhibit these traits in order to see if these students are gifted (Harradine et al., 2014).

In the study, teachers were asked to observe and take notes of their entire class for several weeks and then complete a TOPS Individual Student Observation Form on specific students, with an indication of whether or not that student might have been overlooked without having completed TOPS. Then as a result of their documentation using TOPS, they were asked to complete a TOPS Kid Profile to assess the gifted potential of the teacher's selected students. After completing these TOPS surveys, teachers were asked to complete a closing survey on their analysis of their experience with the program. The authors concluded that teachers were able to recognize the gifted potential of many more students with the survey than without the survey. Race also played a factor in these results, as 53% of the African American boys in the study would not have otherwise been picked as having gifted potential as compared to 24% of White boys. While this survey helped to minimize the disproportion of African American students in the gifted program for this study, there is still a continual underrepresentation of African American and Latinx students. This article was found to be a positive aspect of the gifted program due to the solution brought to light, but the aforementioned problem is still prevalent, and therefore portrays negatively on the gifted program.

Negative Aspects

The literature revealed several negative themes of the gifted program. The themes include the continuous underrepresentation in the identification of students of color in gifted programs (Harradine et al., 2014), the appearance of perfectionism in gifted students (Margot & Rinn, 2019) and (Mofield & Peters, 2015), excessive workload in gifted programs (Kitsantas et al., 2017), and the sense of elitism within the school environment (Gallagher, 2016).

Perfectionism and Excessive Workload

Another prevalent theme was the appearance of perfectionism among gifted adolescents. The goal of Margot and Rinn (2019)'s qualitative study was to examine the perfectionism tendencies of gifted adolescents specifically in relation to their birth order, gender, and grade level. Using a demo-

graphic questionnaire, the researchers were able to collect age, race, grade level and birth order. Then, the student's perfectionism was measured using The Multidimensional Perfectionism Scale (MPS). The results were divided into 4 categories: concern over mistakes, personal standards, parental expectations, and organization. There was a significance in regards to concern over mistakes from 7th grade to 8th grade, 8th grade being much higher. First/only children also have a significant increase in concern over mistakes rather than middle and youngest children. On the personal standards subscale, first born/only children and middle children had higher scores than youngest children and male first born/only children had higher scores on the parental expectations subscale than the rest. According to the organizational subscale, there was a difference between younger and older students such that seventh-grade students had higher scores than 11th grade students (Margot & Rinn, 2019).

Mofield and Peters' study (2015) was centered around determining the relationship between overexcitabilities and dimensions of healthy and unhealthy perfectionism in gifted students. Participants were gifted adolescents in 6th, 7th, and 8th grade who were currently enrolled in a gifted program. Participants completed The Goals and Work Habits Survey (GWHS) and the Overexcitability (OE) questionnaire. Results indicated that certain types of excitabilities corresponded with healthy perfectionism, while others were correlated with unhealthy perfectionism (Mofield & Peters, 2015). According to the article, "Personal Standards (PS) was also predicted by an interaction of high Emotional OE, low Imaginational OE, and high Intellectual OE, suggesting an interaction of sensitivity, lower preference for imagination (Imaginational OE), and high preference for learning and analysis (Intellectual OE) predict the priority for setting high standards of excellence" (Mofield & Peters, 2015, p. 418). Healthy perfectionism was often categorized as an individual who has a lower imaginational OE because of the student's tendencies to be a more analytical thinker rather than use creativity. Unhealthy perfectionism was categorized as an individual who has Emotional OEs and Imaginational OEs. The authors mentioned how students who exhibit high Emotional OEs and Imaginational OEs can be prone to excessive self-criticism and could possibly "imagine" themselves failing or that they are incapable (Mofield & Peters, 2015).

A related subtheme that arose was the excessive workload intended for students in gifted programs. Kitsantas et al. (2017) studied gifted students' perceptions of the gifted program using focus group interviews that lasted about 30 minutes, consisting of 7-9 questions. In terms of self-regulation, some students feel as though the teachers in the gifted program had too high of expectations for the students. They felt overwhelmed by the intense workload and felt like the teachers should work harder to coordinate schedules for homework due dates and tests.

Elitism

The final negative theme was the appearance of elitism in the school environment. Gallagher and colleagues (2016) investigated teacher's attitudes towards different forms of learning for gifted students, mainly ability grouping and acceleration. Teachers were chosen from 4 schools and asked a series of questions related to their opinions on gifted students, their social emotional characteristics, acceleration, and ability grouping. Most teachers believed that part time ability grouping and pull-out groups were effective, while the full-time ability grouping could be unproductive. They were concerned with making the other students feel less than and how it could foster elitism. Teachers were also concerned that full-time ability grouping wouldn't properly represent real-world type situations because of its lack of academic diversity. All objections of this strategy were centered around equity of all students, not just gifted students (Gallagher et al. 2016).

Discussion

Throughout the five research studies retained for the systematic review, there were mixed opinions on the process of the gifted program and how it should be presented to the students, however many of them came to similar conclusions about the lack of access and opportunity to gifted education. There are positive aspects of gifted programs perceived by students in gifted programs. According to Kitsantas et al. (2017), once in gifted programs, students often report that they enjoy the gifted program's efforts towards the inclusion of rigor and creativity in the content, which keeps students engaged and motivated. Kitsantas et al. (2017), shared this quote from a student in their study,

"I feel like I can understand things more. I feel more challenged. It makes you go higher" (p. 275). There was less reported procrastination because of the increased rigor and interest in the material.

There are some concerns that have arisen from the research. This includes the ongoing underrepresentation of students of color in gifted programs, the feelings of elitism in the school environment due to the "gifted" label, and the issue of perfectionism in gifted students. Regarding the underrepresentation of students, there seems to be a major gap within the identification system. As mentioned previously in this review, one article's study said that without the TOPS survey, 53% of the African American boys in the study would not have otherwise been picked as having gifted potential as compared to 24% of White boys (Harradine et al., 2013). While this article has found a potential solution to the inequity of admissions, this issue is still prevalent and is a disservice to the many gifted students of color that are not being identified. Due to many teachers' implicit biases, many teachers are not recognizing the gifted potential in students of color, including "non-teaching pleasing behaviors" (Harradine et al., 2013). These are behaviors that gifted students perform due to boredom or disinterest in a topic being taught in the classroom. If the content is too easy for them, they can become frustrated and disinterested, causing their behavior to worsen. These behaviors include being argumentative, distracting classmates, and asking too many questions. Many teachers are unaware of this method of observing gifted potential and miss these students, especially students of color (Harradine et al., 2013). The limitations of the article by Harradine et al. (2013) are that it is largely exploratory and not every teacher listed the demographic information of the student that they were observing.

The theme of elitism in the school environment was repeated in one of the studies. Gallagher et al. (2016) explained that in their study, teachers were interviewed on a series of questions related to the different types of gifted program types, like: acceleration, part-time ability grouping, and full-time ability grouping. They found most teachers were in favor of the part time ability grouping due to the fear of gifted students never having exposure to academic diversity later in their academic lives. This is important for students to be exposed to in their school career because diverse academic settings would help prepare the students for real world situations. Gallagher et al. (2016) used the following teacher

quote to illustrate this fact, "I had a little boy a few years ago that particularly didn't want to go to [an exclusive private school] and I said 'why?' and he said, 'because here I'm special because I'm better than everyone else. There I'll have people that are equal to me" (p. 20). This shows that academic diversity is critical in students' lives because they are able to have exposure to peers with both higher and lower intellectual abilities. In addition to the disservice the gifted students may face with full time ability grouping, the article also mentions the effects that it has on non-gifted students. Many of the teachers were concerned by the idea of an elitist school environment with continual ability grouping (Gallagher et al., 2016). This could make non-gifted students feel that they are "less than" gifted students. There were no limitations listed in this study, but we would add that one limitation is the idea that the students might have been offering answers they thought that the interviewers wanted to hear, rather than their honest opinions.

Perfectionism is another common theme. There is an immense amount of schoolwork for gifted students and the pressure for perfectionism within gifted education (Mofield & Peters, 2015). Kitsantas et al. (2017) explained,

> When considering students' need for challenge and depth, some students perceived that the gifted teachers assigned too much homework. For instance, students complained that, "We have a huge project that is taking two months and we also have homework. It's really stressful. With the project on top of the homework that we are getting, we are getting buried" (p. 12).

This quote gives a student's perspective on their experiences with an excessive workload in the gifted program, signifying that this can often be difficult for students to manage. This can develop into the pressure of perfectionism. While some perfectionism can be beneficial, too much perfectionism can be detrimental to students' mental health and wellbeing (Mofield & Peters, 2015). According to Mofield and Peters (2015), the unique manifestation of perfectionism in gifted students versus non-identified students is often due to the gifted students' advanced awareness of their personal expectations. Since perfectionism is more common in gifted students, there is a correlation made with the issues in the gifted program itself and the excessive stress the students are put under to be in the program. These studies

were limited by only one school district being included in the interview, data sampling (Kitsantas et al., 2017), and selection bias (Mofield & Peters, 2015). Both studies lacked a randomized controlled sample.

Conclusion

The important limitations of the present study include the fact that it is a small sample size of articles analyzed based on the selection criteria in the PRISMA method. There is also a potential for bias shaped by the authors' own schooling and life experiences.

Overall, gifted programs are beneficial and have a place in schools due to the increased differentiation opportunities they provide and the resulting higher achievement motivation among students (Kitsantas et al., 2017). However, gifted programs can improve by offering greater access to the benefits and opportunities that gifted education provides. There are several social and emotional aspects of the gifted program that means the programs are a work in progress. Between the underrepresented students of color, presence of an elitist school environment, and perfectionistic tendencies, there are many aspects that the education community needs to address to make gifted education a more inclusive and positive experience for students. Regarding the underrepresentation of minorities in the program, a possible solution could be to educate more teachers on "non teacher pleasing behaviors" and provide TOPS surveys for the teachers to complete for the nomination of students into the program, like Harradine et al. (2013) provided in their study. This could allow for teachers to become more educated on students of color and to equitably recognize their gifted potential. Teachers can also work to understand their own implicit biases in regards to race and ethnicities (Harradine et al., 2013). With reference to the elitist school environment for students, schools could offer more opportunities for part-time ability grouping of students to help non-gifted students feel more capable and intelligent. Schools could also even consider changing the label "gifted" to a more neutral and inclusive term. Lastly, to help minimize perfectionism, teachers could ensure that they are providing students with the appropriate amount of work and make efforts early to notice the onset of perfection-

ism in students. Providing extra support to students and the students' families is another way to prevent perfectionistic tendencies in gifted students. If teachers and schools are willing to make changes similar to these, gifted and non-identified students alike will be able to have an inclusive, adaptable, and more supportive social and emotional learning environment.

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Meditation, Personality, and Workplace Stress

Department of Psychological Science
Andrew Waters and Linda Shanock, Ph.D.

Abstract

Stress is prevalent in the workplace and can affect employees at any level of an organization. This study explored the role of meditation frequency, when given the choice of how to meditate, on stress reduction in the workplace. Previous research has emphasized the role of personality traits in perceiving stressful situations (Childs et al., 2014), and this study investigated if conscientiousness and neuroticism personality traits helped to limit or enhance stress reduction. A sample of 40 participants was given the choice of both how frequently they choose to meditate and what style of meditation they chose to practice over two weeks. Results showed that when given the choice of meditation style, meditation frequency had a significant impact on stress reduction. The two personality traits did not provide a significant impact on meditation frequency's

Andrew Waters

Andrew Waters is a 2022 graduate of the University of North Carolina at Charlotte. During his time at UNC Charlotte, he attained a Bachelor of Science in psychology with minors in history and sociology. His research interests lie in employee well-being and organizational team cohesion. He hopes to someday work in organizational development, helping organizations continually improve upon their structure and overall efficiency.

Linda Shanock, Ph.D.

Linda Shanock is a Professor in the Psychological Science Department, a member of the Organizational Science program at UNC Charlotte as well as a nationally board-certified reflexologist and reiki practitioner. Dr. Shanock has published over 40 articles and has been named one of the top 100 most cited scholars in the field of management. Throughout her career Dr. Shanock has focused her research on employee well-being, particularly research involving perceived organizational support (POS) because there are a host of positive outcomes when a person feels valued and cared about by one's work organization. Dr. Shanock plans to continue to work in the employee well-being area with future research focusing on the physical and emotional well-being that comes from working for a supportive organization and on intervention studies improve employee wellness.

change in perceived stress. The findings suggest that the frequency of meditation practice matters, and, in practical terms, future organizational policies may promote employee choice on meditation frequency and style.

Keywords: meditation frequency, meditation autonomy, personality, perceived stress

Meditation, Personality, and Workplace Stress

Stress can create unnecessary agony for employees in the workplace. It hinders individual production output and efficiency, limiting one's performance on the job (Birhanu, 2018 & Mishra et al., 2011). While some research has investigated the use of mindfulness meditation programs to limit the effect of stress on performance, efficiency, and well-being outcomes, they have focused on wide-scale, systematic implementations in which all participants are required to use the same meditation format (Allexandre et al., 2016 & Kersemaekers, et al., 2018). However, meditation has an ambiguous interpretation and can be practiced in a variety of ways (Matko & Seminer, 2019). Therefore, this study incorporates the use of meditation as related to the reduction in stress in an individualized manner. That is, in the current study participants were allowed the freedom and flexibility to incorporate the most effective meditation style for themselves. Also, previous research has indicated personality traits may influence the perception of stressful events within one's environment. More specifically, individuals with high levels of conscientious or neurotic personality traits may perceive things as more or less stressful in their environments (Janjua & Chandrakanta, 2012). Yet there have been limited efforts examining employee personality and potential personality differences in reactivity to work-specific interventions, such as meditation, to reduce stress. This study features three main variables. The two independent variables are the frequency of meditation and two personality traits (conscientiousness and neuroticism), while the dependent variable is the changes in perceived workplace stress throughout the two-week intervention. The first goal of the study was to examine the effect of frequency of meditation, given the context of freely chosen meditation style by the individual, on reduction in stress over time. The second goal was to see whether conscientiousness or neuroticism plays a role in enhancing or limiting that reduction in stress as a result of a freely chosen meditation style. The present study utilizes a pre- and post-test survey design to examine the impact of a two-week meditation program on reductions of stress over the two weeks. Results of this study will help serve as guidance to help reduce stress when in the workplace setting.

Meditation, its Benefits, and Meditation Styles

Meditation has been a traditional practice used for coping with stressful situations. Meditation programs have been shown to improve mood, reduce stress, and lead to greater improvement in attentional control (Walsh et a., 2019). In broad terms, meditation is the mental and training technique used by meditators who tap into an altered state of consciousness.

However, the definition is ambiguous and up to individual interpretation (Matko & Sedlimier, 2019). It is a practice that traces its roots to ancient Buddhist traditions. Meditation is most commonly performed when an individual is in an upright, seated position, focused on his or her breathing. But there are other styles of meditation practices that focus on different goals and movements (Weilgosz et al., 2019). Regardless of the style of meditation, the practice as a whole, when performed consistently, can impact how individuals operate. Gotink et al., (2016) discovered that the long-term effects of meditation have been found to impact individuals' neurological pathways. More specifically, consistent meditation increases brain activity in areas that deal with stress such as the prefrontal cortex and hippocampus (Gotink et al., 2016). It also has an impact on an individual's social environment. Meditation has been found to decrease loneliness and increase daily social interactions (Lindsay et al., 2019). In all, consistent mindfulness interventions provide meaningful impact in a variety of areas. Mindfulness meditation, for one, has been universally found to increase subjective wellbeing (Walsh et al., 2019). Mindfulness meditation refers to a family of practices with a common focus on decreasing distraction and enhancing awareness of the mental state (Wielgosz et al., 2019).

There are three distinct mindfulness meditation styles that help practitioners monitor the present moment, as indicated by Burke et al. (2017). Focused attention meditation (FAM) deals with focusing on a certain object or event and maintaining concentration. It is used as a tool for meditators to stay in the present moment and has been can improve both individual attention and maintaining focus for long periods of time (Scott, 2021). Open monitory meditation (OMM) allows for a gradual defocus of an object to broad monitoring of the surrounding environment, remaining attentive to arising factors. Over

time, open monitory practice can lead to better thinking, increased emotional intelligence, and enhanced ability to overcome mental biases (Voss, 2018). Loving-kindness meditation (LKM) focuses on developing a love for oneself as well as extending compassion towards others, especially to those who are viewed as unlikeable. Over time, individuals who practice LKM have shown an increased capacity for forgiveness, connection to others, and self-acceptance (Scott, 2020). However, mantra meditation distinguishes itself from mindfulness practices by squarely monitoring one's focus on a mentally repeated word or phrase, rather than assessing their environment (Burke et al., 2017). It is performed by repeating syllables, words, or phrases, that help individuals maintain a sense of focus on a specific subject. Two key benefits of mantra meditation use are better management of individual emotions and unwanted thoughts (Lynch et al., 2018).

In addition, the duration of the meditation plays a role in creating meaningful, positive change for the meditator. Long-term use of LKM has been shown to boost performance as individuals increase their meditation skills over time (Zeng et al., 2017). Zeng et al., 2017 goes on to state that duration has an impact on depressive systems as daily meditation is positively correlated with positive emotion. In short, the use of meditation has been shown to increase subjective well-being (Walsh et al., 2019).

Meditation and Stress in the Workplace Setting

Stress is defined as an intrinsic or extrinsic stimulus that evokes a biological response (Yarobeyi, et al., 2017). These responses can lead to a wide range of circumstances for an individual. From changing biological homeostasis to dealing with life-altering mental and physical conditions, stress can be felt to varying degrees (Yarobeyi, et al., 2017). Stress can be acute or chronic. Acute stress rises from episodic, short-term events while chronic stress is enveloped by ongoing stressful conditions that can lead to long-term suffering (Hammen et al., 2017). Individuals are at higher risk of disease when they are in constant exposure to a stressful environment. In essence, stress is felt by individuals in varying degrees and may lead to negative effects if left unresolved.

One of the biggest sources of stress is one's workplace. Recent studies have shown the work setting to have high levels of stress amongst employees, leading to increased burnout rates (Birhanu, 2018 & Mishra et al., 2011). To understand why workplace stress is prevalent, it is critical to understand the factors that contribute to this issue. The World Health Organization has identified the most common stressors or events that cause stress in the workplace. These include but are not limited to employee workload, lack of participation, and control on the job (Maulik, 2017). Issues like these are experienced across industry types. According to Moreno et al. (2020), occupational stress is an issue that is felt worldwide, as stress is the number one cause of workplace absenteeism in the UK and is experienced by 83% of the US workforce. Workplace stress has not only impacted employee wellbeing, but it is making a dent in organizations' financial situations. As a result, there has been a growing attempt by researchers to investigate the cost-of-illness for businesses, or the lack of production due to employee health problems (Hassard et al., 2018). Given that stress is such a widespread problem in the workplace, what are some effective ways to reduce workplace stress?

To combat the issue of stressful working environments, there have been some efforts to explore the effect of various stress-reduction programs on employee well-being, with mindfulness meditation programs being one of the most common (e.g., Kersemaekers et al., 2018 & Allexandre, 2016). These studies have demonstrated that incorporating meditation can positively impact an individual's well-being when facing work-related situations. Kersemaekers, et al., (2018) found a greater reduction in burnout and perceived stress from participants of meditation training compared to scores of the pre-intervention period. Another study performed by Allexandre et al., (2016), examined the influence that a web-based stress management program (WSM) had on its impact on reducing employee stress levels. Participants were divided based on different degrees of access to health resources, but all saw an improvement in their overall mental health. These two studies illustrate the importance of implementing mindfulness programs in the workplace setting. However, such organizationally-led mindfulness programs focus on achieving systemwide problems rather than solving stress dealt with at the individ-

ual employee level. They did not consider the possibility that when given choices on which program to implement, or how long/how often, individuals will be affected by their mindfulness practice of choice. A prominent theory in psychology related to the importance of autonomy is called self-determination theory, the work of which is summarized in Ryan et al., (2021). The authors argue that giving people autonomy over the tasks they engage in (e.g., choice of meditation style in this case) leads to greater subjective well-being, intrinsic interest in the activity, and more. Studies on a wide variety of tasks and contexts, including the workplace, have supported their assertions (Ryan et al., 2021).

H1: The higher the frequency of meditation, as chosen by the participant, the lower the perceived stress over time.

The Role of Personality in Response to Meditation as Related to Stress

Personality traits play a major role in determining an individual's response to a stressful environment (Childs et al., 2014). Childs et al. (2014) goes on to state that those who are more susceptible to criticism and negativity do not show as much resilience as someone who is sharply focused and goal-oriented. On the job, personality also plays a big role as it can influence the amount of success or failure individuals have when battling stressful job situations (Janjhua & Chandrakanta 2012).

The two personality traits that are most commonly associated with differences in responses to stressful situations are conscientiousness and neuroticism (Jackson et al., 2010; Widiger & Oltmanns, 2017). Conscientiousness is defined as the differences in the tendency to follow socially prescribed norms (Jackson et al., 2010). Individuals with high levels of this trait exhibit goal-oriented and impulse control behavior. Obeying social norms and rules, these individuals show meticulous nature in their work. In terms of stress, those with high levels of conscientiousness experience fewer self-dependent episodic and interpersonal chronic stressors than other personality traits (Murphy et al., 2013). According to Vollrath and Torgersen (1999), individuals with high levels of conscientiousness and low levels of neurotic traits have the greatest ability to attack stress out of all personality combinations. This plays a significant role in establishing less than average stress while performing effective coping styles compared to

other personality groupings (Vollrath & Torgersen, 1999). Already equipped to respond positively to stressful environments, those with high conscientiousness might not benefit as much from being asked to meditate each day for two weeks and are hypothesized to experience significant differences through a pre and post-test meditation program.

H2: As conscientiousness increases, the weaker the relationship between frequency of meditation and reduction in perceived stress over time.

Another personality trait that relates to managing stress is neuroticism. This trait is defined as the disposition to experience negative emotions (Widiger & Oltmanns, 2016). Widiger & Oltmanns (2016) go on to state that individuals with high neuroticism experience poor performance when dealing with stressful situations. Additionally, they elicit a higher frequency of irregular responses when dealing with threatening environments around them. Over time, individuals with high levels of neuroticism could suffer and develop cases of asthma, cardiovascular issues, and disruptive immune functioning (Widiger & Oltmanns, 2016). Individuals with high neurotic behavior act poorly in stressful situations. Studies show that those with high neurotic personalities often neglect problem-focused coping and perform significantly fewer methods to boost their mood (Vollrath & Torgersen 1995). Instead, they perform avoidance/discharge coping and select not to deal with stressful situations head-on. The lack of resilience is more apparent when compared to other personality trait combinations. Neurotic personality traits demonstrate an inability to create resilience and respond poorly to attacking stressful situations (Widiger & Oltmanns, 2016). Therefore, those with high neuroticism may benefit quite a bit from being asked to meditate each day for two weeks, and thus neuroticism is hypothesized to have a stronger moderating impact on meditations' reduction in stress.

H3: The higher value of neuroticism, the stronger the relationship between meditation frequency and reduction in perceived stress becomes.

Method

Participants

For this study, adults (24 women, 16 men, M_{age} = 42.2 years, age range: 19-81) were recruited with flyers posted on the UNC Charlotte campus as well as recruitment messages from the primary investigator's (PI) social networks. To qualify, participants must have worked at least 20 hours a week at the time of recruitment, reside in the United States, and were 18 years or older. In terms of where the participants worked, 42.5% worked in labor industries, 25% as professionals, 15% were managers and 17.5% worked in other industries. These were categorized using the nine Employment Equity Opportunity (EEO) job categories (Carsen, 2021). When asked about individual meditation experience, 45% of the participants had no experience while 55% had at least some experience. As for compensation, participants had the option to electronically opt-in to win a $100 Amazon gift card upon signing the consent form. To further incentivize active participation, those who opted-in and filled out all 10 meditation logs were entered to win an additional $50 Amazon gift card. Those who wished to withdraw during the study can at any time could have done so without any repercussions.

Materials

The participants first filled out their demographic survey. These were questions such as identifying race, age, and industry/tenure of employment (see Appendix A). Responses were mainly for descriptive purposes. Additionally, participants were asked to complete personality and stress assessments at the beginning of the study.

Big Five Inventory (BFI)

The next survey that participants filled out at baseline in addition to demographic questions was the subscale Big Five Inventory (BFI). The BFI is a traditional measure used to uncover the degree of each of the five main personality traits. However, this study examined the two that closely relate to the perception of stress, which are conscientiousness, and neuroticism. These two have the opposite

effect on their reactivity to their environment (Vollrath & Torgersen, 1999). Answers for the BFI were scored using a 17-item scale (See Appendix B). Participants answered the extent to which they agree or disagree with statements relating to their personality on a Likert-type scale from 1 to 5, where 1 = Disagree Strongly and 5= Agree Strongly (John & Srivastava, 1999). Thus, higher numbers indicate a greater degree of agreeableness. Questions 2 to 6 and 10, 17 are reversed with the lower number indicating a higher level of agreeableness and will be reverse-scored to be consistent with other items.

Perceived Stress Scale (PSS)

The perceived stress scale (PSS) is a 10-item scale (See Appendix C). These questions are scenario-based, instructing the participant to answer how they feel about certain work-related situations over the last two weeks. These situations do not change throughout the pre and post- test surveys. Participants answered how much stress they felt over a workplace scenario using a Likert-type scale from 0 to 4, with 0 = Never and 4 = Very Often. The higher the number, the greater degree of stress an individual has (Cohen et al., 1983). However, the point value for questions 4, 5, 7, 8 was reversed, with the lower circled number meaning a higher score for that question. At the end of two weeks, participants were asked to take the PSS questionnaire again to analyze the effect of the meditation practice on their stress.

Meditation Log

To ensure that participants fulfilled their meditation requirements, they were tasked to fill out a meditation log (See Appendix D). Participants answered the time, duration, and style of the meditation they used that day. There was also an optional section for participants to express any notable experiences they had while meditating that day. Responses for these open-ended questions were evaluated using thematic analysis, uncovering themes and common behaviors that were found throughout the participants' answers. Meditation logs were filled out each weekday, and participants had the option to meditate on both their days of work and their off days. However, they were encouraged to meditate and fill out their log each weekday, lasting a total of 10 entries. This system was executed through Qualtrics

email surveys and was sent out at 6:00 pm EST. Participants had a span of 12 hours to respond to each daily response. This procedure was orchestrated throughout the entirety of the two-week study.

Procedure

As previously mentioned, the location of the study was completely online. Participants were asked to meditate either just before or during their working hours on the days they work. On non-work days, they were asked to meditate before they start their day, or towards the end of the day. Meditation was captured as how often, and for what duration, the participants meditated for 10 days. This allowed participants to meditate as many times or as little as they chose to.

Participants could also choose which meditation style they wanted to engage in each day, they did not have to use the same style each day (FAM, OMM, LKM, or Mantra meditation). Each participant, regardless of meditation frequency, was required to fill out their daily meditation log.

The procedure began with the PI sending out a training video to the volunteer participants. This included the purpose of the study, styles of meditation they could choose from, how to complete meditation logs, and the ideal time to meditate. Participants had the option to meditate either on working or non-working days, as long as they answered the 10 meditation log entries. After signing the online consent form, participants filled out the two pre-test surveys along with demographic questions. These were the BFI, measuring the degree of neurotic and conscientiousness personality traits, and the PSS, uncovering how much perceived workplace stress they have experienced over the past two weeks. Once completed, participants began their meditation duties the following Monday. The type of meditation was up to the participants. They were free to choose any of the four main meditation practices previously mentioned in the paper. Having an autonomous option of which style to choose leads to a non-discriminatory method and openness to a meditation style that fits each participant.

The duration of each meditation had a minimum time of five minutes. During each weekday, the PI sent out an online meditation log, where participants wrote down the type, style, duration, and time

of their meditation. At the end of two weeks, the participants were sent the PSS again and were tasked to complete it. Lastly, the PI thanked the participants for their part in the effort and began the analysis stage of the study.

Results

The descriptive statistics for this study's variables are presented in Table 1. There was no missing data for the demographic, stress, or personality assessments as all 40 participants completed those tasks. However, 27.5% of data from the meditation logs are missing, as some participants did not meditate during the two weeks.

Table 1

Descriptive Statistics for Study Variables.

	N	Mean	SD
Pre-test Stress	40	2.20	0.77
Post-test Stress	40	2.0	4.25
Conscientiousness	40	3.34	1.13
Neuroticism	40	3.38	0.65
Difference Score	40	2.10	4.17
Days Meditated	40	6.10	4.34
Time Meditated	40	82.05	76.35

The difference in pre-and post-test PSS scores was calculated using a difference score. That is, [pre-test PSS – post-test PSS] reflected potential reductions in stress across the two-week study period. Negative scores indicated stress increased and positive scores indicated stress decreased. Multiple regression analysis using the R software was used to assess the relationships of frequency of meditation (number of days meditated and total time spent meditating) as well as the two personality traits, neuroticism, and conscientiousness, on stress difference at pre-test compared to the post-test. Interactions between each personality variable and each frequency of meditation variable were analyzed to test hypotheses 2-3 regarding potential moderating effects of personality on the relationship between frequen-

cy of meditation and changes in stress from pre-test to post-test.

Furthermore, a qualitative analysis was conducted using a thematic analysis of the participants' meditation log entries. The qualitative data came via three opened ended questions at the bottom of each survey, and it served a multitude of purposes. First and foremost, the analysis was used to uncover trends in how the participants thought and behaved during their time meditating. This may assist future researchers who want to find ways to improve the quality of the participants' meditation sessions. Overall, capturing open-ended qualitative responses helps provide a clearer understanding of the participant's meditation experience that is not evident through quantitative metrics.Throughout the study, a total of 247 meditation log entries were completed. The total meditation time of all participants was 65 hours and 22 minutes, with the average meditation session lasting 16 minutes. Just as the frequency of meditation was autonomously given to the participants, so too was the type of meditation. Using this format, 41.7% chose FAM, 21.46% chose LKM, 19.03% chose Mantra, and 17.81% chose OMM. These percentages were not constant over the ten days, as participants were allowed to choose their preferred meditation style each day of the study, and some participants did not use the same meditation style throughout.

Each meditation log had the same opened ended questions. First, participants were asked, "What did you think about when meditating today?" (See Appendix D). Common answers were that participants used this time to reflect on their day, wanted to release negative thoughts, and imagined a past memory of theirs. For the second question, they were asked, "If applicable, why did you choose this meditation style today?" (See Appendix D). Major takeaways were that participants chose that specific meditation style because they simply liked performing that style before, found it calming, and easy to perform. Lastly, participants were asked, "In today's meditation, what went well and what are things you can improve on?" (See Appendix D). For the positives, participants found that they were able to focus and relax, able to plan for their future, and able to redirect their thoughts back to the meditation exercise. For things that can be worked on, it centered around the problem that some meditation ses-

sions were small in duration. Common explanations were that their environment of meditation was very distracting and thus they were unable to properly relax. Collecting this information can help future researchers comprise new strategies to increase the quality of the participants' meditation sessions.

It was predicted that the more frequently participants would meditate during the two- week intervention, the lower their perceived stress would be by the final post-assessment. To calculate the overall changes in participant stress, a difference score was used to compare the pre and post-test. Those with negative scores indicated that stress increased after the two weeks while positive scores meant that stress decreased. Looking at the 40 total participants used in this study, the sum difference score was +84, indicating that stress largely decreased at the post-test assessment. Additional analyses took place using multiple regression in R software (Table 2).

Results support the first hypothesis, as meditation frequency had a statistically significant impact on the reduction of perceived stress. These results highlight the strength of the individualized meditation program as well as the importance of meditation repetition to warrant limiting perceived stress levels.

The regression analyses involved using two different meditation frequency variables predictors of stress reduction. The regression results in Table 2 involve using meditation frequency as the total amount of days the participants meditated.

Table 2

The Moderating Effect of Conscientiousness (C) and Neuroticism (N) on the Relationship between Meditation Frequency (Days Meditated) and Stress Reduction.

	Stress Reduction		
Predictors	B	*β*	*SE*
Medidation Frequency (Days Meditated)	.36	.37*	.15
Conscientiousness	.13	.11	.23
Neuroticism	.01	.02	.15
C X Meditation Frequency	-.58	-.16	.60
N X Meditation Frequency	.01	.04	.04
R^2			.04

Note. $N = 40$. B=unstandardized regression coefficients.

β = standardized regression coefficients. *SE* = standard error.

* $p < .05$. R^2 = amount of variance in stress reduction explained by all variables in the model.

Table 3 has the meditation frequency variable defined as the amount of time, in minutes, spent meditating over the two weeks. Results from the regression analysis are as follows.

Table 3

The Moderating Effect of Conscientiousness (C) and Neuroticism (N) on the Relationship between Meditation Frequency (Time Meditated) and Stress Reduction.

	Stress Reduction		
Predictors	B	β	*SE*
Meditation Frequency (Time Meditated)	-.001	-.02	.01
Conscientiousness	.18	.14	.25
Neuroticism	-.01	-.01	.17
C X Meditation Frequency	-.40	-.11	.65
N X Meditation Frequency	.02	.08	.04
R^2			.04

Note. $N = 40$. B=unstandardized regression coefficients.
β = standardized regression coefficients. S.E. = standard error. All relationships were non-significant (all were $p>.05$).
R^2 = amount of variance in stress reduction explained by all variables in the model.

Hypotheses 2 and 3 investigated the roles of conscientiousness and neuroticism personality traits and their impact on the overall meditation program effectiveness. It was predicted that higher conscientiousness would lead to a weaker relationship between meditation frequency and reduction in stress, limiting the strength of the intervention. This is because high conscientiousness individuals are already goal-centric and focused, not letting outside pressure or stress derail their productivity (Murphy et al., 2013). Results showed that consciousnesses had no significant impact on that relationship. As for neuroticism, it was believed that a higher level of neurotic personality traits would increase the strength of the intervention. This is because high neurotic personalities are more likely to succumb to stressful situations (Vollrath & Torgersen 1995), and this program was aimed at strengthening that skill

set through meditation. Yet, results show neuroticism also had no significant effect on differences in stress. Both personality hypotheses were not supported, indicating that personality did not play a major factor in the intervention outcome. Participants' ability to meditate as frequently as they wished to impact their changes in stress was not altered nor influenced by their personality traits.

Discussion

Contributions

This study contributed to our understanding of the beneficial effects of meditation on workplace stress. Results showed that higher meditation frequency was statistically significant in lowering participants' perceived stress over two weeks. This supplements previous scientific work highlighting the positive impact meditation can have on one's wellbeing, including workplace stress (Walsh et a., 2019). Additionally, this study supports the use of meditation and its role in helping to reduce work-related stress (Kersemaekers et al., 2018).

However, the current literature on meditation's effects on workplace stress is limited to studies that involve a broad program in which all employees engage in the same meditation frequency and style (Allexandre et al., 2016 & Kersemaekers, et al., 2018). In the current study, we added to that literature by allowing employees to meditate as frequently and as long as they wished, and to choose one of four meditation styles that we trained them in conducting for themselves. Thus, our results show employers that they might have good results if they encourage employees to engage in meditation frequently and allow them other individualized aspects of meditation programs like choice of style. This idea is similar to the findings of Zeng et al., (2017) which highlight the importance of repetition in meditation use.

Additionally, although academic research provides a basis for using conscientiousness and neuroticism personality traits when assessing reactions to or effects of stress in social environments including the workplace (Jackson et al., 2010; Widiger & Oltmanns, 2017), the current study's results did not support the notion that personality makes a difference in meditation frequency's effects on stress. From

a practical standpoint, these findings encourage organizational practitioners to give employees more autonomy when it comes to meditating. That is, they may give employees the option to meditate as frequently and give them the choice to choose the most appropriate meditation style for them. The results indicate that a higher frequency of meditation is more effective for seeing lessened stress over time and practitioners may give employees the option of choosing whichever frequency they find most suitable for themselves.

Limitations and Directions for Future Research

There were several limitations in this study. First and foremost, the sample size (40) of the study was small. This resulted in a low statistical power, which limited the overall detection of potential relationships hypothesized in the study.

Another limiting aspect of the sample was the lack of occupational diversity. Around 67.7% of all participants came from two of the nine main categories of occupations in the US (Carsen, 2021). As a result of limited occupational diversity, external validity becomes limited in that our sample did not represent a large range of employees in different positions and industries.

Another point limitation might be the duration of the study (only two weeks). While participants in this study engaged in meditation practices for two weeks, the impact on longer- term changes in stress from such interventions is an area often overlooked by researchers (Herr et al., 2018). Thus, limiting the study to just two weeks negated the chance of observing the long-term impact of meditation practice on mental well-being. There are two areas that future studies can address, the first one being diversifying and increasing the pool of participants to better represent all working Americans. The other suggestion for future research is to investigate the long-term effect of meditation, spreading out the study to see how stress would change in a period beyond two weeks.

Another limitation was participants' concerns over not finding an appropriate time to meditate. Some noted in the open-ended section of the meditation logs that they either forgot to or did not have enough time to meditate that day. One reason for this was because in the training video that all partic-

ipants saw, the time to meditate was very broad and general. It said that they should look to meditate either just before or during their working hours on the days they work. On non-work days, they were asked to meditate before they start their day, or towards the end of the day. Two solutions may limit this problem in future studies. One is to send all participants an email reminder at noon each weekday to remind them to meditate that day. This way, it helps to alert and remind them to meditate. A second strategy is to give a specific time window in terms of when to meditate. This may specifically be during the participants' lunch breaks, or during a 3-hour window which should help to narrow down the wide variety of meditation times recorded in the logs.The fifth limitation was the attrition in the overall study's design. Asking to perform a daily activity for ten weekdays in a row was a challenge for some participants. There were instances where those who completed their first three or four meditation logs did not fill out the remaining ones. As such, the range in meditation frequency was dispersed, as some meditated zero times while others meditated 10 times. One way to battle this problem is to have guaranteed incentives for all participants. The current study had two randomized chances of winning a monetary reward and thus, only five percent of the entire participant group received any compensation. In future studies, having a base pay rate for all participants may contribute to keeping the overall attrition rate down. The sixth and final limitation was the emotional impact of the external conflict in Ukraine.

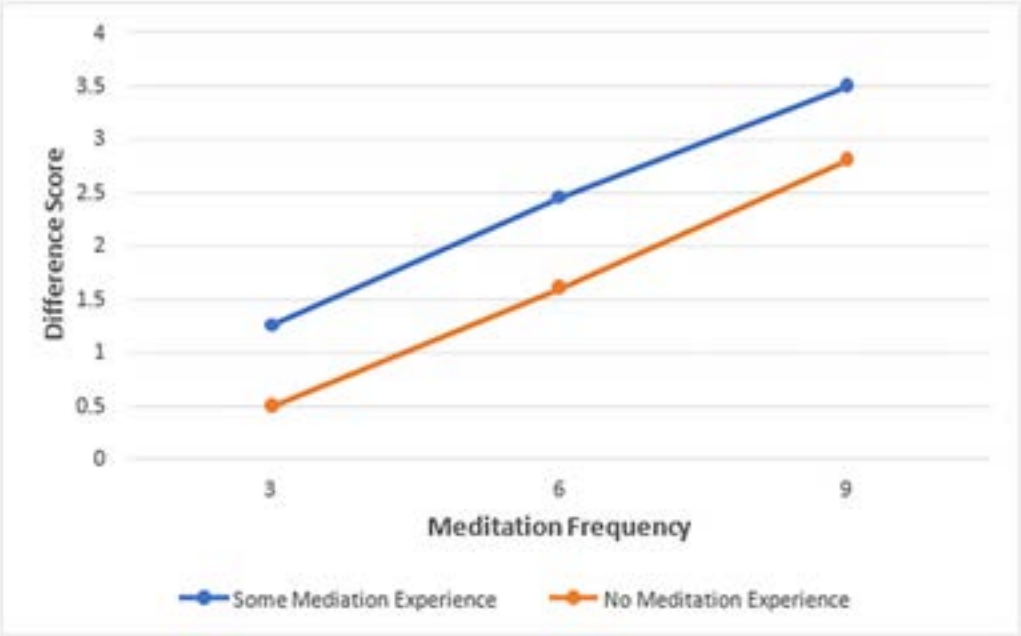
Participants were set up in three groups depending on the time in which they enrolled in the study. Groups two and three comprised roughly 40% of the entire participant count and these groups filled out their meditation logs during Russia's conflict with neighboring Ukraine. Although the battle is not on US soil, the emotional impact has stretched across the world, and this may have influenced participants' stress levels. There is nothing in the way of improving this external influence in future studies, but it is something worth noting.

Some additional directions this study can take revolves around the contrasting frequencies of meditation between Eastern and Western cultures. In eastern countries like China and India, there is a

grounded perception to perceive meditation as an essential part of an individual's life, resulting in very-high frequencies throughout the week (Suchday, 2014). However, in western countries like the US and the UK, meditation is not perceived as the essential route for improving mental health. Instead, there are popular alternatives such as exercising and eating healthy that individuals use to mitigate unwanted stress (Suchday, 2014). This contrast in meditation frequencies and overall experience between western and eastern cultures is an area that is intriguing to explore in future studies. As Figure 1 illustrates, in the current study, those with some meditation experience experienced greater differences in stress scores compared to those with no exprience.

Figure 1:

Meditation Experience on Changes in Stress



Note. Difference score = Pre-test stress minus post-test stress. Meditation frequency = The number of times participants meditated in two weeks.

In future studies, comparing the more frequently practiced meditation use of the east to a lesser performed meditation of the west would help to expand the external validity of the study. Another direction that future studies may look to explore is the time of meditation by participants. Perhaps meditating right before or during the workday can have a significant impact on stress levels compared to those who meditate after work or as they are about to rest for the day. These two avenues both look to expand upon this current study, exploring new ways to improve the internal and external validity of this work.

Summary

This study examined a personal approach to handling meditation as means to address workplace stress. By allowing participants to choose how often and what style of meditation they may practice, it gave them the flexibility to perform the meditation each day over two weeks in whichever way they felt effective. The more frequently participants meditated, the more their stress was reduced over the two-week study period. Quantitative data suggests that many participants did choose a variety of meditation styles rather than sticking with just one. Also, qualitative data suggest they enjoyed having a choice of meditation style. Future studies can perhaps use these results as guidance in creating meditation programs that allow for flexibility, choice, and autonomy.

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Auditory Processing Difficulties Influence on Perceptual Learning

Department of Psychological Science
Katherine M. Fiallo and Alexia Galati, Ph.D.

Abstract

Understanding spoken language is a complex process that comes to most people easily, yet past research demonstrates that some people face difficulties with auditory processing. Listeners integrate auditory, visual, and other cues to understand speech. However, people with auditory processing difficulties rely less on visual cues, such as lip-reading. We investigated how listeners' reported difficulties in perceiving auditory information interact with their use of visual cues. This was a replication and extension of a study by Kraljic, Samuel, and Brennan (2008). Participants viewed a speaker pronouncing some words in one of four conditions, depending on which phoneme was changed (?S or ?SH) and whether the speaker held a pen-in-hand (characteristic) or had a pen-in-mouth (incidental) while producing these words. We assessed each participant's phonemic

Katherine M. Fiallo

Katherine M. Fiallo is an undergraduate student at the University of North Carolina at Charlotte, graduating in Spring 2022. She is majoring in Psychology and Philosophy. Her interests include cognitive science, biological psychology, and early childhood development. She has conducted research in perceptual learning based speech perception. Katherine aspires to enter a clinical psychology graduate program next year and continuing to develop her research skills in psychological science.

Alexia Galati, Ph.D.

Dr. Alexia Galati is an Assistant Professor in Psychological Science at the University of North Carolina at Charlotte, where she directs the Cognition in Interaction Lab. Dr. Galati's research focuses on how language users keep track of their conversational partners' perspective, and how they adapt their linguistic and non-linguistic behavior to coordinate with one another. She uses a variety of methods, including behavioral experiments, discourse analysis, eye-tracking, mouse-tracking, perceptual paradigms, and virtual reality technology. Dr. Galati holds a B.A. (Honors) in Psychology from Stanford University, a M.A. in the Social Sciences from the University of Chicago, and a Ph.D. in Experimental Psychology from Stony Brook University. Before joining UNC Charlotte, she was a postdoctoral researcher at the University of Cyprus and a Marie Skłodowska-Curie fellow at UC Merced.

boundaries in a category-identification task, in which participants categorized ambiguous sounds as being more S-like or SH-like. We measured participants' perceptual learning—the restructuring of their phonemic boundaries—based on their categorization of these ambiguous sounds. Afterward, participants were surveyed on their language background and their auditory processing difficulties. We did not replicate the findings on the effect of visual context on perceptual learning from the original study by Kraljic et al. (2008). Contrary to our predictions, we also did not find an effect of individual differences in auditory processing on perceptual learning and no interaction with visual context. Given that the effect of visual context has been replicated before, our results are inconclusive. The effect of individual differences on perceptual learning should be explored further to gain insight into the underpinnings of perceptual learning and how to improve speech perception for those with auditory difficulties.
Keywords: speech perception, perceptual learning, auditory processing difficulties, phonetic adjustment

Auditory Processing Difficulties and Perceptual Learning

During speech perception, listeners actively interpret spoken speech by combining various cues with previous knowledge. Listeners map acoustic signals onto linguistic elements to understand other speakers (Diehl et al., 2004). Speech perception, though seemingly effortless is an extremely complex process, as it requires listeners to integrate their knowledge of linguistic categories and the variable input produced by speakers. This challenge of mapping speaker variability onto one's mental representation of linguistic categories is often known as the *lack of invariance* problem. The lack of invariance problem arises from the variability in the acoustic signal produced both within and between speakers (Magnuson et al., 2020). Even the same speaker has considerable variability in their speech due to contextual factors (e.g., their speaking rate, the noise in the environment), making flexibility in processing speech sounds essential. Comprehending speech, given these variations, is challenging and involves using several external cues to perceive words accurately (Branigan et al., 2000).

Factors reducing ambiguity during speech perception

Speech variability can be overcome through several means. Listeners adapt their boundaries of speech sounds based on experiences with other speakers. They use lexical, syntactic, and visual information from the speaker to create a representation of the speaker (Branigan et al., 2000). Given the evidence that listeners adjust to speech variations dynamically (Norris et al., 2003), the representations must be flexible. Goldinger's work (1996) suggests part of this flexibility comes from the integration of the episodic memory traces of past speakers to overcome speaker variability. People have an episodic memory for speakers that encompasses voice details and possibly other aspects of speech (Goldinger, 1996).

Visual context is also a factor that helps reduce ambiguity during speech perception. One well known example that demonstrates the role of visual context is the McGurk effect (McGurk & MacDonald, 1976). In McGurk & Macdonald's experiment, those who saw a visual stimulus that differed from the auditory stimulus, in terms of the speech sound presented, would respond incorrectly. For example, if participants heard "gaga" but saw speakers physically create "baba," they typically perceived "dada",

integrating the two sources of information. This integration of information suggests that visual evidence about the speaker's articulation influences speech perception (McGurk & MacDonald, 1976).

There are several theories of speech perception, with some emphasizing the articulatory gestures involved in speech production. One such theory is Liberman's motor theory of speech perception (1967), which characterizes speech production as the result of causal links between phonemes, neuromotor commands, muscle contractions, vocal tract shapes, and acoustic signals. In this view, every phoneme corresponds to a muscle contraction. Additionally, in this view, speech perception operates as speech production does except "backwards," with each segment of language corresponding to a neural signal. People can decode acoustic signals by recalling the articulatory events seen (Liberman, 1967). This view can handle well how listeners perceive variable speech, given that perception relies on the articulatory gestures of speech rather than the speech signal.

Consistent with theories emphasizing the role of observed articulatory gestures on speech perception, other studies highlight the importance of visual information, particularly lip-reading, (Dodd et al., 2008; Woodhouse et al, 2009). Dodd and colleagues (2008) explored how incongruences with audiovisual stimuli can impact the speech perception of people with phonological processing disorders and speech difficulties. The researchers found that lip-reading and heard speech are combined into an articulatory code, regardless of one's own ability to produce the sound. Not only is the combination of audiovisual information important, but research suggests that the auditory cortex is activated simply by viewing a video of someone speaking without any sound (Woodhouse et al., 2009).

Visual context also shapes listeners' attributions about the speakers' auditory signals, allowing for more flexibility in perceptual adjustments. Kraljic and colleagues (2008) explored how the source of auditory signals—based on visual context—influenced listeners' flexibility in speech perception. The researchers measured participants' perceptual learning: the way people restructure their phonemic boundaries to better understand speakers' variation. The present study is a partial replication of the study by Kraljic and colleagues (2008) study, with a focus on their manipulation of audiovisual context.

Kraljic and colleagues (2008) tested perceptual learning by using words containing the phonemes [s] (s sound) and [ʃ] (sh sound). All [s] and [ʃ] words were recorded and had two forms, one with normal pronunciation and another with the [s] or [ʃ] sound shifted towards an ambiguous [~sʃ]. Participants completed a lexical-decision task (i.e., judging whether these tokens were words or nonwords) to expose them to the typical or atypical pronunciations. For the lexical decision task, participants were assigned to one of two conditions, the audiovisual or audio-only. We will only be discussing the audiovisual condition since it pertains to the proposed study. In that condition, participants viewed videos of the same female speaker pronouncing these tokens. The speaker either had a pen in her hand or her mouth. Participants viewed one of these two versions of the stimuli (i.e., a between-participants manipulation), allowing the researchers to examine whether listeners were sensitive to external attributions for varied speech. The *incidental group* always saw the pen-in-mouth visual on atypical tokens (with the [~sʃ] sound) and the c*haracteristic* group always saw the pen-in-hand visual on atypical tokens. All atypical tokens (those with [~sʃ] sound) were in the first half of the list. Kraljic and colleagues (2008) predicted listeners would experience perceptual learning in the characteristic group—when atypical tokens could be attributed to the speaker's idiolect (i.e., the speaker's particular way of speaking)—but not in the incidental group—when atypical tokens could be attributed to an external cause.

Consistent with these predictions, Kraljic et al. (2008) found that listeners only showed perceptual learning in the characteristic group. When exposed to a visual cue that would explain the mispronunciation, listeners appeared to assume that the variation was a result of the circumstance. Kraljic and colleagues concluded that listeners ignored incidental, atypical pronunciations (with the pen-in-mouth), possibly due to sorting the incidental causes separately from other tokens (produced without the pen). These findings challenge Liberman's motor theory, as listeners were able to map speakers' phonemes in a typical manner, even with obstructions to the articulatory gestures.

In a more recent study, Liu and Jaeger (2018) set out to explore an alternative explanation for the finding of Kraljic and colleagues (2008). The researchers suggested that when listeners are uncertain

of the cause of unusual word pronunciation, they use causal inferences, thus potentially blocking their shifting of phonemic boundaries. Liu and Jaeger (2018) examined if boundary shifts are blocked under uncertainty and whether this uncertainty is maintained after viewing unambiguous stimuli (pen-in-hand). The study by Kraljic and colleagues (2008) only measured perceptual learning of atypical pronunciations when they were followed by typical pronunciations of filler words and nonwords. Liu and Jaeger (2018) argued that beliefs can be updated after exposure to audiovisual stimuli that suggest a causal characteristic (pen-in-hand) since listeners remain uncertain of the cause of atypical pronunciations. Their results supported their hypothesis: participants shifted their boundaries when the characteristic condition (pen-in-hand) was followed by the incidental condition (pen-in-mouth). Participants showed causal reasoning when faced with the characteristic (pen-in-hand) stimuli and maintained those inferences later when exposed to disambiguating evidence. People are aware that the atypical pronunciation may have an incidental cause, even when not explicitly seen. These results indicate that causal reasoning prevents the restructuring of phonemic boundaries to stop preemptively attributing atypical pronunciations as a characteristic of the speaker. Liu and Jaeger expanded on the original Kraljic et al. (2008) study, suggesting listeners maintain some perceptual evidence from past experience which can be used to adapt to disambiguating evidence.

The role of individual differences

In our study, we further probe the integration of visual information with auditory speech, while considering individual differences. Our study is a partial replication of Kraljic et al. (2008) study with an additional focus on individual differences as they relate to auditory processing. We included the audiovisual conditions from the study of Kraljic and colleagues (2008) (excluding their audio-only condition), given our focus on the visual components' effect on perceptual learning. Other departures from Kraljic et al (2008) were modeled after Liu and Jaeger's (2018) study: we administered the study online and reduced the number of stimuli participants experienced during the lexical-decision task. The online aspect was shown to produce perceptual learning in a previous web-based study (Kleinschmidt & Jaeger, 2012).

Additionally, using less stimuli has been successful in eliciting perceptual learning in past experiments (Kleinschmidt & Jaeger, 2011; Vroomen et al., 2007). In the present study, we utilize these techniques and add additonal factors to examine.

In addition to these changes to the Kraljic and colleagues' (2008) study, the present study focuses on the role of individual differences in speech perception. People experience speech perception in different ways. How people process auditory information is one of many factors that can influence speech perception. Central auditory processing is how listeners perceive auditory information; it involves the central auditory nervous system as well as other neurological processes to create auditory perceptions (American Speech-Language-Hearing Association, 2005). A growing body of research demonstrates that some people experience auditory processing issues, affecting the ways in which they perceive speech (Chermak, 1997; American Speech-Language-Hearing Association, 2005). One tool to identify individuals with auditory processing difficulties is the (modified) Amsterdam Inventory for Auditory Disability [(m)AIAD] (Meijer, 2003), a self-report questionnaire developed to determine auditory disabilities (Bamiou et al., 2015). Individual auditory processing differences are important to better understand how people overcome the lack of invariance problem when listening to spoken speech, especially as it relates to visual cues (e.g., lip-reading). Auditory processing differences provide insight into the effect of lip-reading as auditory processing difficulties are correlated with impaired lip-reading abilities (Dodd et al., 2008; Woodhouse et al., 2009). Since lip-reading aids speech perception of ambiguous pronunciations, those with auditory processing difficulties rely more on auditory information as visual cues can cause confusion (Bellis & Ferre, 1999). That reliance on auditory information suggests that those with more auditory processing difficulties may be more likely to attribute phonological ambiguity as a characteristic of the speaker, rather than incidental, regardless of the visual information presented. This guides the hypotheses of the present study.

Method

Study overview and predictions

We examined how individual differences in auditory processing affect perceptual learning of speech, replicating and extending the study by Kraljic and colleagues (2008). Following that study, we created four conditions, based on which phoneme was changed (?S signifying [s] or ?SH signifying [ʃ]) and on whether listeners viewed the pen-in-hand (characteristic) visual or the pen-in-mouth (incidental) version of these words. Participants were randomly assigned one of four conditions: ?S-characteristic, ?S-incidental, ?SH-characteristic, or ?SH-incidental (Appendix A). Participants experienced a set of 100 total stimuli. 50% of the stimuli were words, 20 of which contained the critical phonemes [s] or [ʃ]. The remainder of the stimuli were nonwords.

During the lexical-decision task, participants were exposed to audiovisual stimuli and were asked to indicate if the sound was a word or a nonword. After the lexical-decision task, participants completed a category-identification task in which they categorized six syllables into two categories, S and SH. Finally, participants answered questions regarding their experiences processing auditory information by completing the (modified) Amsterdam Inventory for Auditory Disability questionnaire. The responses from the (m)AIAD determined participants' individual auditory processing difficulties.

Based on previous work on utilizing lip-reading to distinguish ambiguous sounds and links between auditory processing difficulties and poor lip-reading abilities, we hypothesized that those with more auditory processing difficulties would be more likely to attribute phonological ambiguity as a characteristic of the speaker in both the incidental and characteristic conditions. Insofar as those with auditory rely less on lip-reading, we expected that they would be less likely to take the pen-in-mouth into account and experience more perceptual learning (shifting of sound categories) in both conditions. In contrast, we expected that those with fewer auditory processing difficulties would perform similar to the findings by Kraljic et al. (2008): only showing perceptual learning in the characteristic conditions. Therefore, as auditory processing difficulties increase, we expected that participants would show more

perceptual learning in the incidental condition.

Participants

Fifty-four participants from UNC Charlotte were recruited through the subject pool of the Department of Psychological Science, managed by SONA systems, to participate for course credit. They were at least 18 years old and identified as English speakers. Participants were instructed to complete the experiment in a quiet room with headphones. Three participants who took a significantly longer time to complete the experiment (> 90 mins) were excluded. The average completion time for the remainder of the sample was 25.08 minutes. Similarly, we excluded four participants who scored lower than 75% accuracy on the lexical-decision task, as low scores may indicate inattentiveness, following Kraljic and Samuel (2005). We initially planned to exclude participants who did not use headphones. However, because a substantial proportion of participants did not use headphones (61.70%), we did not exclude these participants. We will return to these points in the discussion. Finally, we had planned to exclude any participants who failed to respond as instructed on an attention check question; however, no participant failed this attention check. Therefore, analyses were based on the data of 47 participants.

Among these 47 participants, there were 22 female, 24 male, and one nonbinary participant. Their mean age was 19.57 (*SD* = 2.00; range 18-28).

Procedure

Participants completed this experiment online, without supervision by the researchers. Participants were randomly assigned to one of four conditions: ?S-characteristic, ?SH-characteristic, ?S-incidental, and ?SH-incidental. Participants were not told that some words would have an ambiguous sound. To administer the experiment, we used the Psytoolkit software (Stoet, 2010; 2017).

Participants were first given instructions on how to complete the lexical-decision task. Instructions stated that participants would view 100 different audiovisual stimuli and would respond by pressing a button to categorize the sound as a “nonword” (F) or “word” (J).

After completing the lexical-decision task, participants viewed instructions for the category-iden-

tification task, which asked participants to categorize syllables as containing "S" or "SH." Participants were informed that they would hear vowel-consonant-vowel syllables (e.g., "a[ʃ]i" and "a[s]i") and were instructed to quickly press the button, "S" (F key) or "SH" (J key), that best corresponded to what they heard. Participants heard the same six syllables 10 times each.

After completing the category-identification task, participants answered some "Post Experiment Questions" regarding their experience completing the main tasks, such as if they wore headphones. This included an attention check question regarding the perceived gender identity of the speaker, man or woman (Liu & Jaeger, 2018).

Next, participants were presented with the questions from the (m)AIAD. They responded to 28 questions based on their experience, clicking on one of the four responses to each question (i.e., almost never (0), occasionally (1), frequently (2), almost always (3)).

Finally, participants responded to questions about their sociolinguistic background. Before completing the study, participants were debriefed about the purpose of the study—measuring how auditory processing difficulties influence the integration of visual information with audio stimuli.

Materials

Exposure: Lexical-Decision Task

Word and Nonword Stimuli. The original list of stimuli created by Kraljic and Samuel (2005) had 100 words and 100 nonwords, all spoken by a single speaker. There were 20 critical [s]-words (e.g., episode) and 20 critical [sh]-words (e.g., beneficial). For each critical word, a second audio stimulus was created, replacing the [s] or [ʃ] sound with an ambiguous [~sʃ] (a mixture of /s/ and /ʃ/ sounds). The remaining 60 tokens were filler-words, not containing either phoneme, [s] or [ʃ]. All audio was paired with visual stimuli of a woman pronouncing the words. Due to a loss of files from Kraljic et al. (2008), we used videos created for a replication by Babel (2016), who kindly provided them. Each video featured a female speaker with a pen, either in her mouth or in her hand. The original audio stimuli from Kraljic et al. (2008) were paired with a Babel (2016) video for all conditions.

Stimulus Lists. Unlike Kraljic et al. (2008), who used 2 lists of 120 stimuli, we created four lists of 100 stimuli each. In each list, half the items were words (n= 50), and the other half were nonwords (n=50). Of the 50 words, 20 were "critical words" and 30 were filler words. Filler words and nonwords were randomly selected from the original Kraljic et al. stimuli and used in all four lists (Appendix B). Additionally, half the items were paired with pen-in-hand videos, and the other half were paired with pen-in-mouth. Consistent with Kraljic et al. (2008), [s] and [ʃ] words were presented in the first half of the stimuli, randomly inserted amongst words and nonwords.

Category-Identification Task

Participants were asked to categorize six different syllables—all with consonances ranging on an S-SH continuum—into two categories, S or SH. The continuum had six points with steps from [s]-like to [ʃ]-like. All six syllables fit into each of the six points on the continuum, with the [s]-like stimulus being "asi" and the [ʃ]-like stimulus being "ashi" (Appendix C). Participants were instructed to categorize these syllables as containing an S or SH sound by quickly pressing a button ("S" (F key) or "SH" (J key)). Participants heard the six syllables ten times in a randomized order.

To measure perceptual learning, following Kraljic and colleagues (2008), we computed the absolute difference between "SH" responses and "S" responses in the category-identification task (|% "SH" responses - % "S" responses|).

(modified) Amsterdam Inventory for Auditory Disability and Handicap

The (m)AIAD (Meijer 2003) is a self-report questionnaire used to determine auditory disabilities. It contains 28 questions and a Likert response scale (see Appendix D), allowing participants to judge how often they experience specific auditory difficulties in their daily life. Questions concern five categories of auditory perception: distinction of sounds, auditory localization, intelligibility in noise, intelligibility in quiet, and detection of sound (Appendix E). Responses were on a Likert scale of 0-3 based on four response options: almost never (0), occasionally (1), frequently (2), almost always (3). Total scores were determined by adding the scores from all 28 questions for each participant. The higher the partici-

pant's score, the fewer auditory difficulties they are attributed to have. We presented the (m)AIAD as an online survey to participants.

Language Background and Experience Questionnaire

The Language Background and Experience questionnaire includes 44 questions (all taken from Cox & Goldrick's OSF files (2021)). The questionnaire involves several response methods, including multiple-choice, Likert scales, and open-ended responses. It includes questions regarding participants' fluency in the English language as well as any other language(s) the participant may know. There are also a few general demographic questions (e.g., gender and age) as well as more specific questions that relate to language, such as where the participant lived while learning the language and how often they speak the language. The questionnaire also includes questions regarding participants' hearing loss, speech or language impairments, or visual impairments–identical to those in the original questionnaire. We chose to include these questions from the original questionnaire to ensure that participants' perceptual learning differences are not due to these factors.

Questions Regarding Experience Completing the Experiment

Participants were asked eight questions regarding the main tasks, identical to those used in the Liu and Jaeger (2018) study. These questions ensured that participants were attentive during the study, did not experience technical issues, and completed the study in a quiet room with headphones.

Results

Analysis Plan

Our goal was to examine the effect of visual context, phonemic manipulation, and individual on the perceptual learning effect. Toward that end, our primary confirmatory analysis plan involved building a linear regression model with predictors for visual context (incidental: "pen-in-mouth;" characteristic: "pen-in-hand"), phonemic manipulation (S-word context, as in "episode" vs. SH-word context, as in "beneficial") (See Appendix B), and individual differences auditory processing (entered as the centered and scaled (m)AIAD score). The regression model also included the interaction between visual context

and individual differences in auditory processing, since we had hypothesized the size of the perceptual effect could differ across auditory processing difficulties. The perceptual learning effect was defined as the absolute difference between "SH" and "S" responses) in the category-identification task for each participant. To evaluate the statistical significance of the effect of each predictor, we used p = .05 as the criterion level, as it is common in the social and behavioral sciences.

Below, we report these planned analyses, as well as an exploratory analysis we conducted to establish the effect of wearing headphones, after establishing through the "Questions Regarding Experience Completing the Experiment" that the majority of participants did not wear headphones as instructed. We also conducted a set of exploratory analyses aimed at confirming that participants were responding as expected in the category identification task, selecting "SH" more frequently when the stimuli were more SH-like: these analyses involved the step in the continuum of the stimulus as a predictor of the individual trial choices (SH or S).

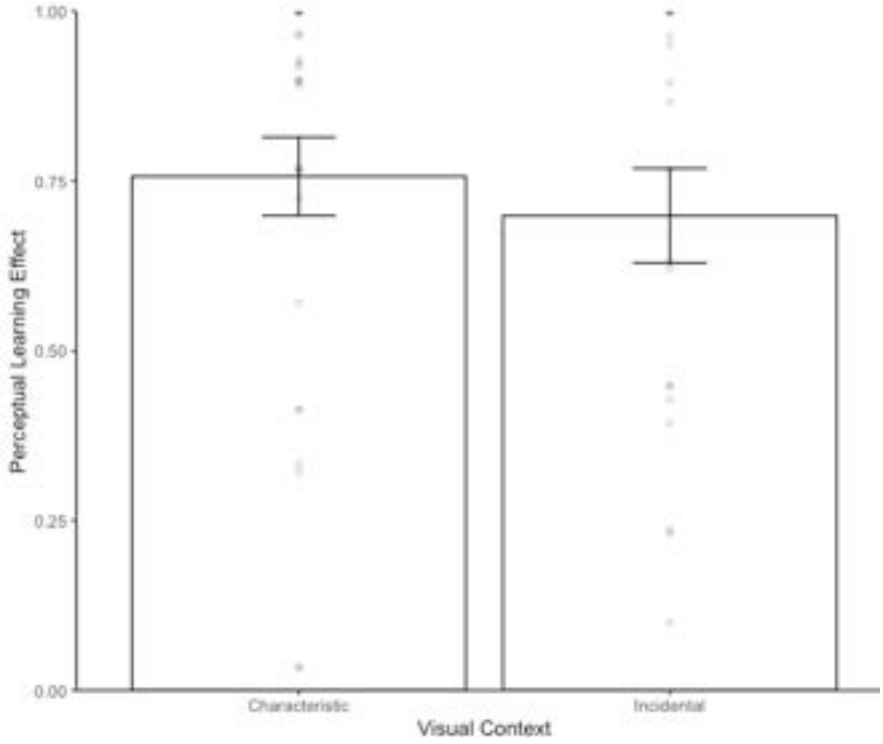
Finally, we provide some descriptive statistics about participants' individual differences in auditory processing on the (m)AIAD questionnaire, and about participants' language background, including their fluency in English and other languages spoken.

Category-Identification Task Results

Overall, the mean perceptual learning effect (absolute difference between "SH" and "S" response) in the category-identification task was .73 (*SD* = .30), which suggests a large difference in the proportions of "SH" and "S" responses. Participants identified the ambiguous stimuli as "SH" most of the time (the proportion of "SH" responses for the characteristic condition: *M*= .84, *SD* = .23; incidental: *M* = .85, *SD* = .16). In an open response question, many participants expressed that the stimuli in the category-identification task seemed more "SH" like. As Figure 1 shows, participants' perceptual learning effect was numerically larger in the characteristic condition (pen-in-hand; *M* = .76, *SD*= .30) than the incidental (pen-in-mouth; *M* = .70, *SD* = .31) condition, consistent with Kraljic and colleagues (2008).

Figure 1

Perceptual Learning Effect Across the Two Conditions of (characteristic vs. incidental).



Note. Error bars represent the standard error of the mean and points represent the scores of individual participants.

However, this effect of visual context was not statistically significant (see results of the linear regression model in Table 1). The interaction between visual context and individual differences, which was of theoretical interest, was also not significant: there was no evidence that the perceptual learning effect depended on the participant's auditory processing differences. As illustrated in Table 1, none of these predictors had a significant effect on perceptual learning.

Table 1

Results of Linear Regression Model on the Perceptual Learning Effect

	B	*SE*	*t*	*p-value*
(Intercept)	0.69	0.09	7.84	<.0001
Visual context	-0.07	0.09	-0.72	0.48
Phonemic manipulation	0.11	0.10	1.08	0.29
(m)AIAD (scaled and centered)	0.003	0.06	0.05	0.96
Visual context * (m)AIAD	-0.05	0.10	-0.48	0.63

Note. Visual context and phonemic manipulation as categorical predictors, and (m)AIAD is a continuous predictor.

Exploratory Analysis: Examining the Effect of Headphone Use

Since many participants did not wear headphones (62%), we conducted a follow-up exploratory analysis examining if headphone usage interacted with perceptual learning. We added "headphones" as a categorical predictor to the linear regression model described above. This factor did not have a significant effect on perceptual learning (B = -.029, SE = *.162,* t= -*.18,* p = .86) and did not change the effects of the remaining factors in the model (p > .46). This suggests that headphone usage did not drive the null effect of visual context on perceptual learning.

Exploratory Analysis: Examining the Effect of Stimulus Ambiguity (Step in Continuum)

We also conducted exploratory analyses on phoneme choices ("SH" or "S") on individual trials as predicted by visual context, phonemic manipulation, and the stimulus step in the continuum. We built two mixed logistic regression models with S-choice (as shown in Table 2) or SH-choice (as shown in Table 3) as the binary dependent variable (with values 1 vs. 0 indicating the presence and absence of each choice). Visual context, phonemic manipulation, and step in the continuum were modeled as fixed effects

and participants as a random effect. The random effect structure included random intercepts and random slopes for steps in the continuum (which was a within-participants factor)[01].

Table 2

"SH"-Choice Mixed-effects Model

	χ^2	*df*	*p-value*
(Intercept)	9.38	1	0.002
Visual Context	0.085	1	0.77
Phonemic Manipulation	0.27	1	0.60
Continuum level	22.51	5	<.0001

[01]The syntax for the linear mixed effect model in R for these models was: glmer(PhonemeChoice/~VisualContext + Phoneme + continuumlevel + (1 +continuumlevel | participantCatID), data=CatIDData, family = "binomial", control=glmer-Control(optimizer="nloptwrap", calc.derivs=FALSE))

Table 3

"S"-Choice mixed-effects model

	χ^2	*df*	*p-value*
(Intercept)	9.32	1	0.002
Visual Context	0.09	1	0.76
Phonemic Manipulation	0.28	1	0.60
Continuum level	22.65	5	<.0001

Visual context (for SH choices: $\chi^2(1) = .09$, $p = .77$; for S choices: $\chi^2(1) = .09$, $p = .76$) and phonemic manipulation (for SH choices: $\chi^2(1) = .27$, $p = .60$; for S choices: $\chi^2(1) = .28$, $p = .60$) were not significant predictors of phoneme choice. However, the continuum step was (for SH choices: $\chi^2(5) = 22.51$, $p < .001$; for S choices: $\chi^2(5) = 22.65$, $p < .001$]. As Figures 2 and 3 show, participants were more likely to respond "SH", which is consistent with the stimuli being more SH-like as the steps increased.

Figure 2

Proportion of "SH" Choices Across the Six Steps of the Continuum

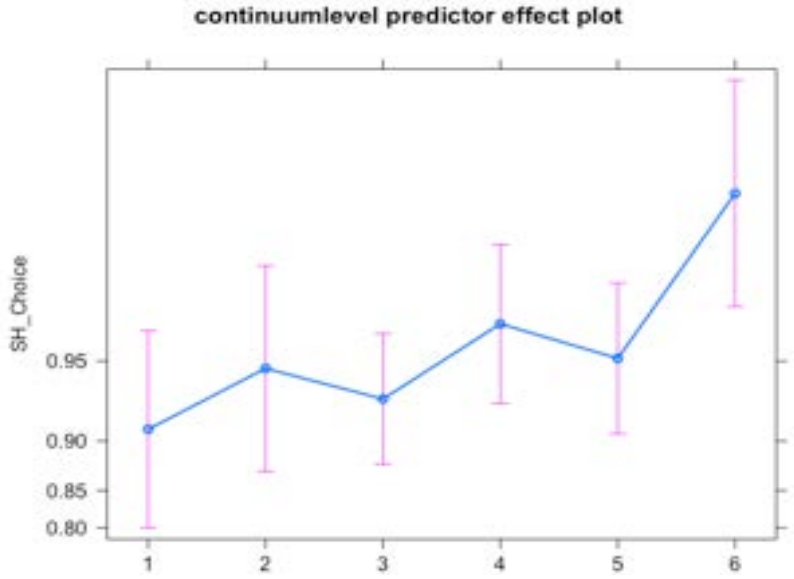
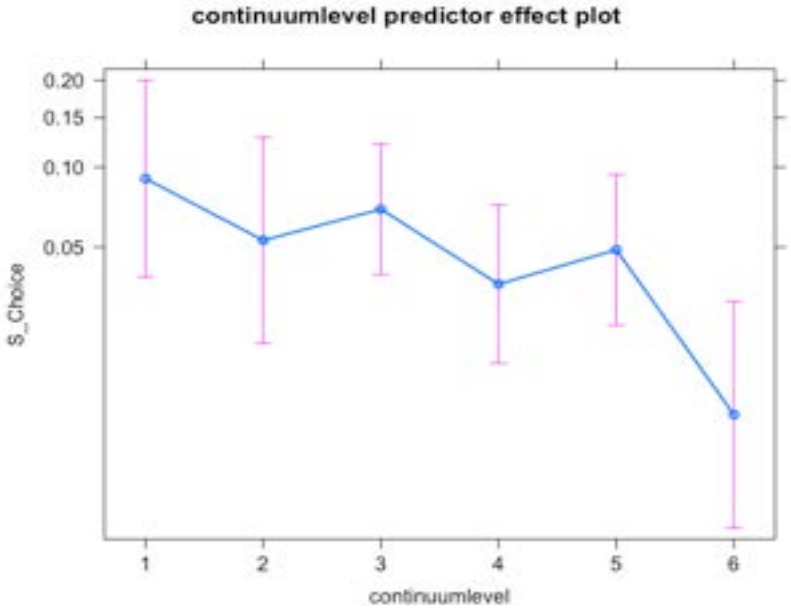


Figure 3

"S" Choices Across the Six Steps of the Continuum



Summary of Results of Category-Identification Task

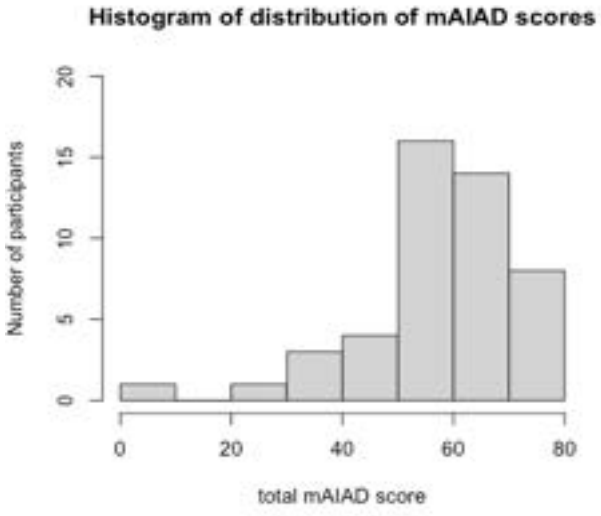
In contrast to Kraljic and colleagues (2008), we found no effect of visual context on perceptual learning, which was computed based on the aggregated proportions of "SH" and "S" responses. We also found no effect of visual context on the individual selections of either phoneme in more sensitive analyses that modeled participants as random effects. We did not find an effect of individual differences or interaction of individual differences with visual context.

Sample Descriptives: Individual Differences in Auditory Processing

In terms of individual differences in auditory processing, participants had a mean (m)AIAD score of 57.19 (*SD* = 13.47; range = 0-78, median = 58). Figure 3 presents the distribution of these scores. As shown, one participant scored 0, indicating extreme auditory processing difficulties (or else responding inauthentically). We did not exclude this participant from the analysis because they did not fail any of the other exclusion criteria we had specified in advance.

Figure 3

Histogram of (m)AIAD Scores in this Sample



Sample Descriptives: Language Background

Using responses to the Language Background questionnaire, we computed participants' mean fluency in English. This was based on four questions asking about ability in reading, writing, speaking, and listening (rated on a 0-10 scale). On average, participants scored 8.64 (*SD* = 1.35) across the four items. For listening, which is most relevant to this study: 8.81 (*SD* = 1.56).

The majority of participants first learned English in North Carolina (*N* = 29, 61.70%). 15 participants learned English in a state besides North Carolina, and the remaining three learned English outside of the USA (Australia, Jamaica, and Nigeria). Twenty-one participants knew a second language, and four of them a third language.

Discussion

In contrast to Kraljic and colleagues (2008), we found no effect of visual context on perceptual learning. Additionally, we found no effect of visual context on the individual phoneme selections during the category-identification task. We hypothesized that those with more auditory processing difficulties would demonstrate more perceptual learning in the incidental condition (pen-in-hand). Our findings did not support our hypothesis, as individual differences in auditory processing showed no effect on perceptual learning and did not interact with visual context.

Despite findings by Kraljic and colleagues (2008) and the successful replication of those findings by Liu and Jaeger (2018), we did not find a significant effect of visual context on perceptual learning. This is surprising as Liu and Jaeger (2018) replicated Kraljic and colleagues (2008) results successfully with an online experiment. The failure to replicate previous findings could be due to a small sample size or technical reasons, which we describe below.

As noted, our findings did not support our hypothesis that individual differences moderate perceptual learning. There was no significant difference between those who scored higher on the (m)AIAD and those who scored low, in that (m)AIAD was not a significant predictor of perceptual learning. This is unsurprising since the effect of visual context on perceptual learning was not detected. Another reason

for these findings could be insufficient variation in individual differences in this sample since most participants scored high on the (m)AIAD.

Because the study was conducted fully online, it was difficult to control the environmental conditions under which participants completed the experiment. Despite previous research showing perceptual learning can still be produced via online studies (Kleinschmidt & Jaeger, 2012), we did not find an effect of visual context on perceptual learning. Participants may have been inattentive while completing the study, and as a result, may have missed the variation in how speakers produced phonemes during the lexical-decision task or missed the differences in "S" and "SH" sounds in the category-identification task.

Another limitation is that we had a small sample size—smaller than our target of 140. Our sample size of 47 may have been too small to detect an effect. Other limitations may have arisen from the data collection methods used on the (m)AIAD. Participants may have not been able to accurately assess themselves on the self-report questionnaires to determine auditory processing difficulties [(m)AIAD].

Despite these limitations, we were able to collect rich information about the participants' language background, which can be used by future researchers interested in examining the relationship between perceptual learning and sociolinguistic background.

Future research can use a larger sample size, which may allow for more robust and conclusive results. Other improvements include using a more controlled experimental setting to ensure participants' attentiveness. More attention checks can also be included to ensure participants' attentiveness. Future research can replace the self-reporting method of measuring auditory processing difficulties, so that participants' auditory processing difficulties are assessed through a task (e.g., having participants report what they hear following audio stimuli).

Another future direction could involve examining other sources of individual differences, beyond those concerning auditory processing. For example, dialectal differences among participants can be explored further. Since S and SH could be allophones in some words in different dialects (e.g., "street" and "shtreet"), exposure to such dialectal variation could impact how perceptual learning for these phonemes

is affected by visual context (i.e., by attributions about the source of variability in the speaker). Future research can ask participants about their dialect or use a task that reveals information about dialectical differences.

Given that the effect of visual context has been replicated before, our results are inconclusive. We did not find evidence for such an effect, but as noted this study had some limitations. The role of individual differences in auditory processing on perceptual learning should be further explored, as this can lead to auditory disabilities accommodation development.

APPENDIX A

Table A1
Distribution of items in ?S-characteristic condition

	Pen-in-hand	**Pen-in-mouth**
Words	10 **[sh]**: **normal** version	
	10 **[s]**: **atypical** version	
	10 filler words	20 filler words
Non-words	20 nonwords	30 nonwords

Table A2
Distribution of items in ?S-incidental condition

	Pen-in-hand	**Pen-in-mouth**
Words	10 **[sh]**: **normal** version	
		10 **[s]**: **atypical** version
	15 filler words	15 filler words
Non-words	25 nonwords	25 nonwords

APPENDIX A

Table A3
Distribution of items in ?SH-characteristic condition

	Pen-in-hand	**Pen-in-mouth**
Words	10 **[s]**: **normal** version	
	10 **[sh]**: **atypical** version	
	10 filler words	20 filler words
Non-words	20 nonwords	30 nonwords

Table A4
Distribution of items in ?SH-incidental condition

	Pen-in-hand	**Pen-in-mouth**
Words	10 **[s]**: **normal** version	
	10 **[sh]**: **atypical** version	
	15 filler words	15 filler words
Non-words	25 nonwords	25 nonwords

APPENDIX B

Table B1

Filler Words/ Nonwords and Four Stimulus List

Filler Words	***Filler Nonwords***	
negate	kradomet	perkum
lethal	Ithomel	emhoutic
tutorial	lirthy	bimobel
blueberry	pirugalo	alnadiro
keyboard	mowery	aknid
continually	bimikay	bikanian
panic	niritaly	ryligal
marina	anolipa	ibirak
eighty	rakil	marody
liability	rikmaral	nowim
lobbying	tilegkalo	admunker
membrane	kermimer	rumatik
lingering	gondimually	bamtel
ironic	hilder	loubel
platonic	tamical	kloumidiger
nightmare	gerbualo	namuery
directory	bawaseet	rengimer
inhabit	nomemtoly	aigi
pilgrim	itempider	lilgrai
outnumber	hintarber	durkuwomt
laminate	kegimel	
burglary	pogunemd	
document	wonontic	
gullible	neramgory	
honeymoon	mikid	
hurdle	rawamtee	
worldly	onple	
turbulence	waiper	
melancholy	gairelom	
undermine	Indalier	

Note. 40 Filler Words and 60 Filler Nonwords (all used in each of the four lists)

APPENDIX B

Table B2

Level of Phonemic Manipulation: Dark Grey Representing S-word Phonemic Manipulation and Light Gray Representing SH-word Phonemic Manipulation

?S-characteristic	?S-incidental	?SH-characteristic	?SH-incidental
10 [s]→[~sʃ] words	***10 [s]→[~sʃ] words***	***10 [ʃ]→[~sʃ] words***	***10 [ʃ]→[~sʃ] words***
literacy	episode	initial	ambition
medicine	arkansa	machinery	beneficial
obscene	coliseum	negotiate	brochure
parasite	compensate	official	commercial
peninsula	democracy	parachute	crucial
personal	dinosaur	pediatrician	efficient
pregnancy	embassy	publisher	flourishing
reconcile	eraser	reassure	glacier
rehearsal	hallucinate	refreshing	graduation
tennessee	legacy	vacation	impatient
10 [ʃ] words	***10 [ʃ] words***	***10 [s] words***	***10 [s] words***
initial	ambition	literacy	episode
machinery	beneficial	medicine	arkansa
negotiate	brochure	obscene	coliseum
official	commercial	parasite	compensate
parachute	crucial	peninsula	democracy
pediatrician	efficient	personal	dinosaur
publisher	flourishing	pregnancy	embassy
reassure	glacier	reconcile	eraser
refreshing	graduation	rehearsal	hallucinate
vacation	impatient	tennessee	legacy

APPENDIX C

“S” - “SH” Continuum

“asi” a[~sʃ]i “ashi”

Each point represents one of the six steps, each having an accompanying audio stimulus. Stimuli closer to the left sound more like “asi” whereas those on the right sound more like “ashi”

APPENDIX D

(modified) Amsterdam Inventory For Auditory Disabilities

1. Can you understand a shop assistant in a crowded shop?
2. Can you carry on a conversation with someone in a quiet room?
3. Do you immediately hear from what direction a car is approaching when you are outside?
4. Can you hear cars passing by?
5. Do you recognize members of your family by their voices?
6. Can you recognize melodies in music or songs?
7. Can you carry on a conversation with someone during a crowded meeting?
8. Can you carry on a telephone conversation in a quiet room?
9. Can you hear from what corner of a lecture room someone is asking a question during a meeting?
10. Can you hear somebody approaching from behind?
11. Do you recognize a presenter on TV by his/her voice?
12. Can you understand the text that's being sung?
13. Can you easily carry on a conversation with somebody in a bus or car?
14. Can you understand the presenter of the news on TV?
15. Do you immediately look in the right direction when somebody calls you in the street?
16. Can you hear noises in the household, like running water, vacuuming, a washing machine?
17. Can you discriminate between the sound of a car and a bus?
19. Can you follow a conversation between a few people during dinner?
20. Can you understand the presenter of the news on the radio?
21. Can you hear from what corner of a room someone is talking to you being in a quiet house?
22. Can you hear the door-bell at home?
23. Can you distinguish between male and female voices?
24. Can you hear rhythm in music or songs?
25. Can you carry on a conversation with someone in a busy street?
26. Can you distinguish intonations and voice inflection in people's voices?
27. Do you hear from what direction a car horn is coming?
28. Do you hear birds singing outside?
29. Can you recognize and distinguish different musical instruments?

Excluded items:

18. Do you experience that music is too loud for you, while others around don't complain about the loudness?
30. Do you miss parts of music while listening to music or song?

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ISSUE 2

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

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undergradresearch@uncc.edu | (704) 687-5316