

THE UNDERGRADUATE RESEARCH JOURNAL OF

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Special thanks to our founders and past members, Dr. Aaron P. Blaisdell, Dylan Sarnowski and the rest of the University of California, Los Angeles, Department of Psychology, and all of the faculty, staff, and graduate students who have supported us throughout the years. Dear readers,

We are proud to present the eighth volume of The Undergraduate Research Journal of Psychology (URJP) at UCLA. This volume is the culmination of months of dedication and determination from our authors, staff members, and graduate student mentors throughout the past year.

As the world braved the COVID-19 pandemic, our journal also persevered through the personal and shared adversities that came along with it. Our Marketing and Finance team led our transition efforts as they promoted our journal and expanded our virtual accessibility through innovative social media. Our Submissions and Workshops team facilitated the basis of our journal, both externally collecting articles while internally empowering our staff. Our editors diligently reviewed and refined the articles with the help of graduate student mentors who provided support and guidance every step of the way. Our graduate student and faculty advisor, Dr. Aaron Blaisdell, gave our journal and its members an abundance of sagacity and care when mentoring and advising. Our readers continue to support us in their everlasting belief in the quality of our publications. We are thankful for our community's continued perseverance in crafting a publication of superb quality, even when the state of the world was less than ideal.

Of course, this would not have been possible without the authors who diligently revised their manuscripts by each deadline they had. The publication before you features the articles of six budding researchers, each with a uniquely personal and educational background. Their contribution to the field of psychology provides impressive groundwork for the future study of critical questions the field has yet to answer. Their research provides significant evidence for the tenacity, brilliance, and skill that researchers must possess even at an undergraduate level. Upon reflecting on this year, with appreciation and contentment in our hearts, we acknowledge that URJP at UCLA has continued to empower and highlight the best of undergraduate research. We are confident that staying true to our mission will be apparent across the pages of this very publication.

Sincerely,

Vanessa Hilo and Vivian Nguyen

Editors in Chief

PREFACE



Dillon H. Murphy, M.A. Doctoral Student, Cognitive Psychology University of California, Los Angeles Department of Psychology

It is my honor to write a preface for the eighth volume of The Undergraduate Research Journal of Psychology (URJP) at UCLA. I recently began working with the editorial staff of the URJP as a graduate mentor where I provided guidance in refining drafts accepted to the final round of submissions. After observing the hard work, passion, and insight of both the authors and the dedicated team at the URJP, I have no doubt that this year's issue will be highly influential and have an incredible impact on their careers.

The URJP team consists of editors, staff directors, submission and workshop managers, marketing and finance directors, graphics and layout managers, and graduate student mentors, all of whom influence the direction of current research and contribute to our advancing knowledge of psychology. To maintain their high standards, the editorial team organized the peer-review of each article which provides authors with an excellent opportunity to learn more about the skills and techniques necessary for the research process. As a result, scholarly outlets like the URJP are crucial in the development of the next generation of researchers and the dissemination of new findings in psychology.

The six new papers in this year's issue reflect the fruits of months or even several years of labor. When starting research on a new topic, reading the primary literature and writing your first paper is like jumping into the middle of an ongoing conversation. At first, it is easy to get lost but certain themes will endure and with enough experience, a bigger picture begins to take shape. Ultimately, reviewing previous work, designing and conducting a study, synthesizing the results, and publishing your findings can foster an understanding of the research process. As a result, the authors of the current issue have gained the skills necessary to conduct their own independent research which will provide a solid foundation of knowledge for their academic careers.

As you begin reading this year's issue, you will learn about a wide range of topics from many different areas of psychology, including clinical, cognitive, developmental, health, and social psychology. Specifically, dive into cognition and physiology by reading articles that examine memory and vascular health in older adults, cervical cancer screening behavior in Honduran women, and cognitive complaints following a stroke. Explore novel insights into the psyche of today's youth by reading about personal resilience and internalizing disorders in Latinx adolescents and how teachers' praise influences children's learning preferences. You will also learn more about how society's reliance on the Internet can become pathological as illustrated by internet gaming disorder. These articles each reflect unique and novel contributions to their field of psychology and were written by undergraduate scholars from around the globe.

Although the world is beginning to open up again, we must not forget the persistence and dedication to research demonstrated by both the authors and the URJP team. The present issue is a testament that research prevails despite whatever obstacles we encounter. The Undergraduate Research Journal of Psychology, published at UCLA by a talented team of undergraduate students, includes some of the best undergraduate research conducted in the past year. As you explore the fascinating work of students from Wayne State University, University of Oklahoma, UCLA, Stanford University, Tilburg University, and the National University of Singapore, I implore you to share your newly gained knowledge with your colleagues, classmates, and friends. Thanks to the authors' and the URJP team's dedication to research, we can all reap the benefits of these new articles and hopefully become more informed and knowledgeable as a result.

Sincerely,

Dillon Murphy

Dillon Murphy July 2021



Shelby D. Darichuk, BS Wayne State University

Shelby Darichuk graduated with a Bachelor of Science in Psychology and Neuroscience from the Irving D. Reid Honors College at Wayne State University in the Spring of 2021. For her first two years at Wayne State, she was a research assistant in Dr. Paul Toro's Laboratory where she contributed to the DPATH-3 study, focusing on homelessness in the Detroit area. She then joined Dr. Jessica Damoiseaux's Connect Laboratory, where she began her research on cognitive aging through analysis of MRI-derived brain imaging. Shelby is interested in continuing her education in pursuit of becoming a Doctor of Osteopathic Medicine. In her free time, Shelby is a yoga teacher and enjoys teaching free community yoga classes in Detroit.

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Was there a particular experience that sparked your research interests?

I grew up hearing stories of my great grandmother, Grandma Apsley - a bold British woman who was vivacious enough to practice headstands at age 70. Her incredible strength and sense of humor was the glue of her and her husband's family of 8. I always felt a deep connection to Grandma Apsley, despite never meeting her as she passed away from Alzheimers before I was born. This connection fueled an interest in studying the development and early detection potentials of neurodegenerative disease.

Who has been the most influential person in your life?

Many people in my life have had a substantial role in molding me into who I am today. Firstly, my parents instilled in me their perseverance, kindness, and grit which are values I hold dearly to me as I navigate through life. Secondly, my mentors throughout my college experience have fine tuned my professional skills and have given me the tools necessary to pursue my professional goals.

What is your greatest accomplishment?

In 2020 and 2021 the collective and myself experienced great hardship due to the pandemic. Despite the obstacles, I was able to complete my undergraduate degree and my 200 hour yoga teacher training. Being able to flourish through hard times has been a testament to my resilience and an inspiration to continue when times get hard in the future.

Where do you see yourself in 10 years?

I aspire to be a Doctor of Osteopathic Medicine with my own Psychiatry practice. I see myself

continuing to encourage my patients to use yoga as a tool for their mental health - as that is

what has helped me so much throughout the years. I also hope to continue my research in my

clinical practice to help facilitate positive change in the field as a whole.

Characterizing Spatial Coefficient of Variation in Arterial Spin Labeling: Associations with Age, Cognition, and Vascular Health in Older Adults

Shelby D. Darichuk, Patrick J. Pruitt, Jessica S. Damoiseaux^{*} Psychology Department, Wayne State University Detroit, Michigan, United States

Cerebral perfusion may play a role in cognitive aging and can be measured using the neuroimaging method arterial spin labeling (ASL). A recently developed ASL parameter, spatial coefficient of variation (sCoV), provides complementary information to traditional perfusion measures. Spatial CoV has been suggested as an alternative hemodynamic measure to predict prolonged arterial transit time (ATT), which is related to neurodegenerative disorders such as Alzheimer's disease. Our objective was to explore the associations of sCoV with aging, cognition, and vascular health. We collected ASL data, neuropsychological testing data, and self-reported demographic and cardiovascular data from older adults in the Netherlands (n = 33, 13 women, mean age 67.58 ± 8.32 years). Spatial CoV had a statistically significant positive correlation with age (r = 0.427, p = 0.013) and a statistically significant negative correlation with a measure of episodic memory performance (WMS Delayed Memory index score; r = -0.439, p = 0.015). The association between episodic memory and sCoV was no longer statistically significant after controlling for age and biological sex. Spatial CoV also had small associations that were not statistically significant with measures of vascular health. The associations of sCoV with age and episodic memory in older adults highlight its potential to characterize the association between vasculature and cognitive decline through aging. However, the small association between sCoV and episodic memory performance after controlling for age suggests this effect may be subtle and require more strongly powered studies to characterize the relationship between sCoV and cognition in older adults.

Keywords: spatial coefficient of variation, cognitive aging, arterial spin labeling, cerebral blood flow

Individual differences in cognitive aging are thought to relate, in part, to differences in brain structure and function. Even healthy aging is associated with a slow decline in higher executive control functions, information processing speed, and memory function, as well as degradation of brain structure (Grady, 2012; Ibaraki et al., 2019; Vis et al., 2018). In recent decades, neuroimaging has provided a novel approach for researchers to investigate the neurobiological mechanisms of cognitive aging, as magnetic resonance imaging (MRI) has been used to non-invasively measure facets of brain structure and function. One promising measurement to understand cognitive aging is blood perfusion in the brain, which is defined as the delivery of nutrients to the brain via blood flow (Ibaraki et al., 2019). Cerebral blood flow (CBF) is a parameter that measures perfusion. One way to quantify CBF is through the use of the fMRI modality arterial spin labeling which was developed in the 1990s (ASL; Bangen, 2007; Detre et al., 1992; Detre & Wang, 2002; Mutsaerts et al., 2020).

Previous researchers have used ASL to investigate the relationship between blood perfusion in the brain and cognition, and this approach has shown both promise and pitfalls (Mutsaerts et al., 2016; Mutsaerts et al., 2020). Evidence in older adults shows a link between lower CBF and a decline in episodic memory (Biagi et al., 2017; Grady, 2012; Vis et al., 2018). Episodic memory is the memory of personally experienced events that occurred at a specific time and location and is often seen to decline throughout the lifespan

^{*} We have no conflicts of interest to disclose. Correspondence concerning this article should be addressed to Jessica Damoiseaux, damoiseaux@wayne.edu

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(Harada et al., 2013). Notably, episodic memory loss is also one of the first indicators of Alzheimer's disease (Jahn, 2013). CBF is also predictive of early-stage cognitive impairment in a variety of neurodegenerative problems, vascular diseases, and other health concerns such as diabetes (Ibaraki et al., 2019).

Unfortunately, CBF may be a suboptimal measure of brain perfusion in older adults because of the increased amount of time it takes for blood to perfuse in this population, particularly in individuals with vascular pathology. ASL functions by tagging or labeling arterial blood water molecules with a radio frequency (RF) pulse that inverts the molecules as they flow into the region of interest. A temporal measurement, referred to as arterial transit time (ATT), is defined as the time it takes for blood to be transported from the area of the initial RF pulse to a given region of interest (Alsaedi et al., 2018; Mutsaerts et al., 2016; Mutsaerts et al., 2020). ATT has been considered a macrovascular parameter that provides clinically relevant information but is often not used in conjunction with CBF quantification due to the degree of complexity ATT acquisition adds to the ASL scan.

Prolonged ATT has significant clinical implications as it has been linked to neurodegenerative disorders such as Alzheimer's disease and may reflect early-onset symptoms (Mak et al., 2012; Mutsaerts et al., 2016; Mutsaerts et al., 2020). Despite its significance, ATT is often not examined directly with ASL CBF guantification due to the extra scanning time required, as well as additional necessary steps in post-processing (Mutsaerts et al., 2016; Mutsaerts et al., 2020) which leads to a decreased signal-to-noise ratio (SNR; MacIntosh et al., 2015; Mutsaerts et al., 2016; Zaharchuk et al., 2011). As a result of these obstacles, CBF maps are often interpreted without the benefit of the macrovascular information provided by ATT. These macrovascular artifacts, therefore, limit the reliability of CBF quantification when studying neural aging (Mutsaerts et al., 2016; Mutsaerts et al., 2020).

Individual differences in vasculature can result in prolonged ATT which leads to incomplete delivery of cerebral blood by the time imaging data are collected. The final image reflects CBF signal intensity which is artificially high in some regions and low in others (Mac-Intosh et al., 2015; Mutsaerts et al., 2016; Mutsaerts et al., 2020; Zaharchuk et al., 2011). Such a delay is problematic in the interpretation of CBF maps, as areas of low signal are commonly thought to reflect low perfusion, when in fact they may reflect delayed perfusion due to high ATT (Mutsaerts et al., 2016; Mutsaerts et al., 2020). Individual differences such as biological sex and mental state also contribute to the measurement of CBF. Esposito (1996) found that women had higher CBF on all measures of their neuropsychological testing. In their study, they admit that this finding was due to mental state and different tasks may have yielded different results. Other studies have found that women had overall higher CBF, but the effect of age remained

significant in its effects on CBF levels (Alisch et al., 2021). This area of research is developing new information daily as this effect is not completely understood.

CBF is inherently connected to measures of microvasculature as they are what directly contribute to perfusion. Cerebral microvasculature are the smallest blood vessels in our brain that receive blood from larger vessels, or macrovasculature, to carry out perfusion. The main assumption of CBF is that it is highly associated with neural activity through neurovascular coupling (Aslan & Lu, 2010; Vis et al., 2018). In other words, the vascular supply provides neurons with the energy needed to function properly, and CBF measures the blood supply to the brain and is therefore sensitive to changes in activity (Aslan & Lu, 2010; Petcharunpaisan et al., 2010; Vis et al., 2018). Dysregulation of CBF is commonly associated with microvascular disease and a decline in CBF is thought to be a key component in development of small vessel disease (De Silva, 2016; Joutel, 2015). Cerebral small vessel disease (CSVD) impacts the microvasculature (Li et al., 2018) and has been connected with cognitive decline, stroke, and other dementias (De Silva, 2016). Furthermore, the cerebral microvasculature is a major site for ischemic stroke and has been linked with major dementia and known neurological diseases that have vascular components (De Silva, 2016). Thus, it is clear that CBF measurements carry clinical significance but currently need to be improved upon as they may reflect inaccurate information in individuals with varied vasculature.

The present study uses a recently developed hemodynamic parameter called the spatial coefficient of variation (sCoV; Mutsaerts et al., 2016; Mutsaerts et al., 2020). Spatial CoV has been shown to be an effective proxy for ATT (Ibaraki et al., 2019; Mutsaerts et al., 2016; Mutsaerts et al., 2020) but does not require additional scanning time and is provided as an outcome parameter by ASL data-processing software such as ExploreASL (Mutsaerts et al., 2020). Low sCoV suggests a normal ATT and produces CBF maps that will have reliable interpretation. Participants with intermediate and high sCoV show higher variability in signal across the region of interest in the CBF map, which suggests a higher ATT. This variability resulting from high ATT can lead to misinterpretation of the CBF map. Mutsaerts et al. (2016) found a strong correlation between the sCoV and ATT in gray matter. Spatial CoV was found to be predictive of ATT per individual. Spatial CoV was also found to be associated with age and biological sex which are known correlates of perfusion (Esposito et al., 1996; Mutsaerts et al., 2016). Researchers suggest that sCoV used as a proxy for ATT provides similar information with more efficient acquisition (Ibaraki et al., 2019). Moreover, in patients with prolonged ATT, sCoV may provide more statistically strong information than CBF because it has a higher reliability and is less sensitive to individual differences in perfusion (Mutsaerts et al., 2016). While a promising measure, our understanding of the biological relevance of sCoV and its relationship with other metrics relevant to cognitive aging is still early in its development. The role of vasculature in cognitive aging is not well-understood, a situation further complicated by the unreliable nature of CBF in older adults, particularly those with vascular pathology. Therefore, we set out to characterize the association of sCoV, a robust measure of macrovascular function, with other key measures related to cognitive aging since the information regarding macrovascular function provided by sCoV may provide a promising complement to CBF data.

It is clear from previous research that CBF is not only a powerful tool for studying cerebral pathology, but it can also be an important measure that is predictive of early-stage cognitive impairment in a variety of neurodegenerative problems, vascular diseases, and other health concerns such as diabetes (Ibaraki et al., 2019; Vis et al., 2018). Researchers believe identifying macrovascular dysfunction in the early stages will help impede the development of major dementia and Alzheimer's disease (Aslan & Lu, 2010; Clark et al., 2017). Furthermore, it is noteworthy that CBF reduction has been found in the medial temporal and inferior parietal regions which are common sites in the development of Alzheimer's disease (Ibaraki et al., 2019). Research from Clark et al. (2017) suggests that perfusion is strongly dependent on macrovascular components due to their effect on ATT as the signal can be greatly compromised by prolonged conditions. The additional information that ATT contributes to CBF measurements is significant when dealing with various health concerns because ATT measurements provide an extra layer of clarity in older populations with compromised vasculature.

This study aims to characterize the relationships between sCoV with age, cognition, and vascular risk. Macrovascular ASL measures have been found to be associated with aging, as both ATT (Liu et al., 2012) and sCoV (Mutsaerts et al., 2016) were found to be positively associated with age. We expect to replicate previous findings of a positive correlation between sCoV and age. We also hypothesize that sCoV is negatively correlated with cognitive performance based on the assumption that sCoV will complement CBF correlations with cognitive decline due to the inherent connection between vascular components. Finally, given that sCoV is a macrovascular measure, we hypothesize that sCoV is positively correlated with vascular risk.

Methods

Participants

The sample was drawn from adult volunteers (N = 33, 13 women, M = 67.58, SD = 8.32, range 45-85 years) from Leiden University in the Netherlands. Leiden University Medical Center advertised through clinics around the university. All participants had scores \geq 25 on the Mini-Mental State Examination (Folstein et al., 1975), which is considered within the cognitively normal range (Tombaugh & Mcintyre, 1992). Furthermore, all participants performed in the cognitively normal

range as determined by either clinical assessment or performance on Wechsler Memory Scale IV indices of no less than 1.5 standard deviations below the normative mean (Drozdick et al., 2012) for two or more indices. Exclusion criteria included a history of neurological disorders, psychiatric disorders, cardiovascular disease, brain injury, cancer, pregnancy, use of psychotropic medication, left-handedness, history of brain damage, and magnetic resonance contraindications including implanted electrical devices (pacemaker) and metallic clips (aneurysm clip). Informed consent was obtained for all measures. Participants were made aware that some may experience claustrophobia. Participants were also notified that MRI poses no known risks for healthy adults who are not pregnant. This study was approved by the Committee of Medical Ethics at the Leiden University Medical Center.

Procedures

All participants were administered three hours of neurophysiological tests. Participants were allowed breaks as needed throughout testing. MRI testing was performed prior to cognitive testing. Cognitive tests were administered in a controlled laboratory environment with paper and pencil or on a computer. Cognitive tests were performed on a separate day than the MRI scan. The ASL scan lasted 5 minutes and 29 seconds, near the end of a larger, hour-long MRI session. Participants were instructed to stay still in the scanner. No questionnaires were given in the scanner during the ASL scan.

At the cognitive visit, participants' blood pressure was collected. Global cognitive function was measured using the MMSE (Folstein et al., 1975). Memory was assessed using the Wechsler Memory Scale (WMS-IV; Wechsler, 1945, 2009). Executive functioning was assessed through the Stroop Task (Stroop, 1935). Participants completed the Godin Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shepard, 1985) to assess physical activity and the Edinburgh Handedness Inventory to ensure right-handedness (Oldfield, 1971).

MRI Data Acquisition

Participant scanning occurred at the Leiden Institute for Brain and Cognition on a 3T Philips Achieva TX scanner. As part of a larger scanning protocol, PCASL images were obtained: 60 volumes (30 control/tag pairs), 19 slices, TR = 4000 ms, min TR = 3926ms, voxel size = 3.0mm x 3.0 mm x 7.0 mm, labeling duration 1525 ms, post-label delay = 1650 ms. Background suppression was applied during collection of PCASL images. Separate M0 calibration images were collected for quantification of cerebral blood flow: 19 slices, TR = 6000 ms, voxel size = 3.0mm x 3.0 mm x 7.0 mm. Additionally, whole-brain T1-weighted structural images were acquired: 140 slices, TR = 9.7 ms, TE = 4.60 ms, FA = 8°, FOV = 224 mm, and voxel size = 1.2 mm × 1.2 mm × 1.2 mm.

ASL

The mechanism of ASL involves labeling or tagging arterial blood water molecules by using a radio frequency (RF) pulse under the region of interest. This RF pulse inverts the inflowing spins within water molecules in the blood and decreases the sum of the overall net magnetization. During the transit time, the inverted spins within the blood water flow into the slice of interest and then reduces the tissue water magnetization. The signal is proportional to the net magnetization vector, so this is also reduced. The change in tissue magnetization reflects the amount of arterial blood delivered to each voxel in the region of interest. The tag image is taken, and this process is then repeated without labeling the arterial blood to create the control image. The tag and control images are then subtracted and what remains is the perfusion image (University of Michigan fMRI Laboratory: Arterial Spin Labeling).

Measures

MRI Data Processing

ASL data were processed using the ExploreASL toolbox (<u>https://github.com/ExploreASL;</u> Mutsaerts et al., 2020), which runs in a modified version of SPM (Wellcome Department of Imaging Neuroscience, London, UK; <u>https://www.fil.ion.ucl.ac.uk/spm</u>). First, T1-structural images underwent rigid-body registration to MNI template, and this transformation was also applied to ASL and M0 images. Structural images then underwent tissue segmentation using the Computational Anatomy Toolbox (<u>http://www.neuro.uni-jena.de/cat/</u>) and were resampled to 1.5 x 1.5 x 1.5 mm voxel size. Segmented structural tissue images were spatially normalized to a common space using DARTEL (Ashburner, 2007).

Next, ASL images underwent motion correction and registration to the T1 structural image. Pairs of tag/control images were subtracted, then averaged for each participant into perfusion-weighted images. These perfusion-weighted images were then calibrated using M0 images to create CBF images. These CBF images were then used in the calculation of the spatial coefficient of variance for each participant.

Spatial CoV

Spatial CoV is defined as the standard deviation of CBF divided by the mean CBF within the region of interest (Mutsaerts et al., 2016). In ExploreASL, we calculated spatial CoV in grey matter using the following equation:

$$sCoV = \sigma(CBF_{M})/\mu(CBF_{M}) \times 100\%$$

Higher sCoV suggests poorer macrovascular function. As seen in Figure 1, those with high sCoV have greater contrast in the image which we believe to reflect macrovascular artifacts in individuals with prolonged arterial transit time. The high contrast depicts spuriously increased CBF in vascular regions while simultaneously showing spuriously decreased CBF in other regions.

Cognition

WMS Delayed Memory Index Score

The Delayed Memory Index score is a measure of delayed episodic memory performance, calculated using delayed recall proportional scores (raw score/max score) for logical memory, verbal paired associates, designs, and visual reproduction. Episodic memory is described as the memory of events occurring at a specific place and time (Schacter et al., 2009). Higher raw, proportional, and index scores all indicate better performance. Logical memory was measured by telling participants two stories (one is repeated twice) that participants must retell. Design memory was measured by participants being tested on their memory of locations of several items on a grid and then presented with a blank grid to place cards with the correct designs in their subsequent locations. Verbal paired associates were measured by reading a series of word pairs to participants, and after delay, they are given the first word in the pair and must recall the paired word. Visual reproduction was measured by having participants observe geometric pictures of increasing complexity for a brief period and then draw them from memory.

Stroop Ratio Score

The Stroop task (Stroop, 1935) engages aspects of executive function including interference control, processing speed, and working memory. The Stroop task was administered to participants in three stages. First, participants were asked to read a list of color words (e.g., red, blue, green) written in black ink as fast as they could. Next, they were asked to name a list of colors as fast as they can (color page). Finally, they were presented a list of color words written in colored ink, in which the color of the ink and the color described by the word were incongruent (color-word page). The participant was instructed to read the color of the ink that the word was printed in regardless of the word. Each portion of this test was timed, and errors were recorded. We calculated the Stroop ratio score as the ratio between the time to read the Stroop (color-word) page divided by the time to read the color page, such that higher ratios indicate greater interference caused by incongruency and therefore poorer executive control.

Vascular Risk

Pulse pressure

Pulse pressure was calculated by taking the difference between systolic blood pressure and diastolic

Figure 1

Levels of sCoV in CBF Maps



Note. (A) Low sCoV is depicted. There is a generally even spatial distribution of signal across grey matter, indicating that labeled blood had sufficient time to perfuse throughout grey matter before the images were taken. (B) Reflects intermediate sCoV which shows increased variability in the signal. (C) High sCoV is depicted as some regions show very high signal and others low signal. This reflects that labeled blood that has not yet perfused throughout grey matter, putatively as a result of reduced macrovascular function.

blood pressure. A low pulse pressure is <40 and can indicate decreased cardiac output. A high pulse pressure is >60. As people age, arteries begin to harden, and pulse pressure increases in general. High pulse pressure is associated with risk of stroke or heart attack, especially in men (Seladi-Schulman, 2017).

Mean Arterial Pressure

Mean arterial pressure is defined as the pressure in the patients' arteries during a cardiac cycle (Bonsall, 2011). It is considered a measure of perfusion to the body's vital organs. Mean arterial pressure was calculated by adding systolic blood pressure and diastolic blood pressure, as noted in the equation below:

MAP = Systolic BP + (2*Diastolic BP)/3

Modified Vascular Risk Score

We calculated a composite modified vascular risk score using measures of hypertension, body mass index, smoking factors, blood pressure, and physical activity. Modified vascular risk accounts for the level of physical activity measured by Godin LTEQ physical activity questionnaire in which the participants disclose the total number of minutes per category of exercise per week. Level of physical activity is known to lower overall vascular risk. Our equation for modified vascular risk score was:

VR_{mod} = Hypertension + ((Systolic Blood Pressure-120)/20) + (BMI/20) + Smoking - ((\sum LTEQ /4)/7)

and used the following measures: hypertension (current

hypertension diagnosis/anti-hypertensive medication, 1= yes, 0=no); systolic blood pressure: < 120 is considered in the normal range, body mass index (BMI); BMI is a measure of body fat calculated as the ratio of weight and height. BMI = weight in kg / height in m2. 18.5-25 is considered the healthy range; smoking: 1=yes, 0=no; Σ LTEQ = (# of 15-minute blocks of Strenuous Exercise / week) + (# of 15-minute blocks of moderate exercise / week) + (# of 15-minute blocks of mild exercise / week). A higher modified vascular risk score reflects greater vascular risk.

Statistical Analysis

Spatial CoV and Age

Statistical analyses were performed in SPSS v25. We initially examined relationships between sCoV and measures of interest using bivariate correlation. Pearson's correlation coefficient was calculated sCoV and the following: age, WMS Delayed Memory Index Score, Stroop ratio, pulse pressure, mean arterial pressure, and modified vascular risk score. For correlations which reached statistical significance, we then planned to build a regression model to re-examine any significant associations after controlling for age and biological sex. These variables were controlled for due to the associations that were previously found between sCoV with age and biological sex (Mutsaerts et al., 2016) and the correlates between perfusion with age and biological sex (Biagi et al., 2007; Espositio et al., 1996).

Results

We first assessed the relationship between sCoV and age using bivariate correlation. Spatial CoV

correlated positively with age (r = 0.427, p = 0.013; Figure 2).

Episodic Memory and Age

We assessed the relationship between episodic memory and age next, also using bivariate correlation. The association between age and episodic memory had a significant negative correlation (r = -0.523, p = 0.002).

Spatial CoV and Cognition

To assess the relationship between sCoV and cognition, we correlated sCoV with the WMS Delayed Memory Index score as a measure of episodic memory performance, and sCoV with Stroop ratio as a measure of executive function performance. Spatial CoV showed a moderate, statistically significant negative correlation with a WMS Delayed Memory Index score (r = -0.439, p = 0.015; Figure 3) but did not show a significant correlation with Stroop ratio (r = 0.075, p = 0.677).

We further examined the relationship between sCoV and episodic memory by testing a linear regression model with sCoV as the criterion variable, and WMS Delayed Memory Index score, age, and biological sex as predictor variables. The overall model was significant (F(3,26) = 5.71, p = 0.004). After correcting for age and biological sex, there was a small association between WMS Delayed Memory Index score and sCoV, which was no longer statistically significant (β = -0.200, p = 0.269, r = -0.216). Notably, when controlling for episodic memory and biological sex, there was a significant positive association between age and sCoV (β = 0.379, p = 0.040, r_p = 0.390). There was also a significant effect of biological sex on sCoV ($\beta = 0.343$, p = 0.036). A post hoc comparison of marginal means found that this effect was driven by men (M = 81.41 \pm 3.41) having higher sCoV than women (M = 69.32 \pm 4.19).

Spatial CoV and Vascular Risk

To assess the relationship between sCoV and vascular risk, we correlated sCoV with pulse pressure, mean arterial pressure, and a composite modified vascular risk score. Spatial CoV showed small correlations which did not achieve statistical significance with pulse pressure (r = 0.285, p = 0.114), mean arterial pressure (r = 0.268, p = 0.138), and modified vascular risk (r = 0.185, p = 0.318).

Discussion

In the present study, we sought to characterize sCoV, a recently developed macrovascular measure derived from ASL data, in the context of cognitive aging. To this end, we examined the relationship between sCoV and several measures relevant to cognitive aging: age, cognitive performance, and vascular risk. Our

Figure 2

Associations of Spatial CoV with Age



Note. Spatial CoV correlated positively (r = 0.427, p = 0.013) with age. As age increases, participants tend to have higher sCoV.

Figure 3

Spatial CoV and Episodic Memory



Note. Spatial CoV correlated negatively (r = -0.439, p = 0.015) with a measure of episodic memory. As episodic memory performance increased on the WMS Delayed Memory task, sCoV scores tended to decrease.

main findings reflect that poorer macrovascular function, as in prolonged arterial transit time, due to age may be reflected by increased sCoV measurements. Additionally, we found a decline in episodic memory performance related to high levels of sCoV; however, this relationship was no longer significant after controlling for age and gender which are two known correlates of sCoV (Mutsaerts et al., 2016; Mutsaerts et al., 2020).

Our study found that poorer macrovascular function as indicated by higher sCoV is associated with poorer episodic memory. This is important because as people age, they tend to display poorer macrovascular function (Mutsaerts et al., 2016; Mutsaerts, 2020) which may lead to early stages of cognitive dysfunction as seen in Alzheimer's and other dementias. This phenomenon highlights the strong negative relationship we found between age and episodic memory performance, suggesting that the older participants in this group to some extent may already be experiencing cognitive decline. The positive relationship between sCoV and age is a replication of previous findings (Mutsaerts et al., 2016; Mutsaerts et al., 2020). Our sample uncovered a relationship between sCoV and age with a similar effect size as seen in Mutsaerts et al. (2016). Our finding that sCoV is predictive of diminished episodic memory performance is significant to aging research because episodic memory loss is often the first complaint of cognitive aging (Grady, 2012; Harada et al., 2013; Vis et al., 2018). Higher sCoV levels predict diminished cognitive performance on episodic memory tasks, and in general sCoV is predictive of memory performance. If age and gender are not considered as variables, the overall effect is reduced, which suggests they may be important moderators that contribute to strengthening the relationship between sCoV and cognitive decline in episodic memory tasks. It is important to note that although biological sex does play a role in our findings, there are discrepancies in the literature regarding the impact of gender on cerebral perfusion and cognitive state must be considered (Esposito, 1996). Although Esposito (1996) found higher global CBF measurements in biological females generally, the sex differences were only seen during frontal lobe tasks and not sensorimotor control tasks. Moreover, within the frontal lobe tasks there was great variance in the results. This suggests that different conclusions may have been formed due to the nature of the task rather than reflecting different levels of global CBF between males and females.

The finding that higher sCoV scores are indicative of poorer macrovascular function and are associated with age-related decline in episodic memory suggests that sCoV is a valuable hemodynamic measure that provides information about age and cognitive function. In other words, including sCoV may provide a more complete understanding of CBF. It is known that age-related decline in CBF provides clinically relevant information as it has been predictive of worse performance on tasks measuring executive function, processing speed, working memory, reasoning, and episodic memory (Ibaraki et al., 2019; Vis et al., 2018), plus lower CBF in the medial temporal and inferior parietal regions may be connected to the development of Alzheimer's disease (Ibaraki et al., 2019). Therefore, the use of sCoV in complement to CBF can be useful in clinical applications in aging populations or with patients who have compromised vasculature.

We did not find a significant relationship between sCoV and executive function that would mirror previous findings between low CBF and diminished executive function performance (Vis et al., 2018). One explanation of this is that executive function is multifaceted and is composed of working memory, flexible thinking, and self-regulation. Moreover, additional measures beyond the Stroop ratio may be needed to fully understand this complex function. It is noteworthy that although age was not able to predict performance on Stroop ratio score in this sample, suggesting that participants did not face cognitive deficits in executive functioning in general, higher age was found to be highly predictive of diminished episodic memory performance. Current research supports this finding as episodic memory loss is a more common side effect of aging (Grady, 2012; Harada et al., 2013; Vis et al., 2018). Additionally, the Stroop Ratio score only reflects some aspects of executive function, such as interference control and working memory (Stroop, 1935), which is one of the main components of executive function and is highly correlated with processing speed (Kim & Park, 2015); however, executive function also encompasses processes such as planning and decision-making (Diamond, 2012; Vis et al., 2018).

Surprisingly, the associations between sCoV and measures of vascular risk were also small, and not statistically significant. While the correlation between aging and CBF have been well researched (Biagi, 2017; Grady, 2012; Vis et al., 2018), less is known about the relationship between cognitive aging and cerebrovascular factors. Aging and cerebrovascular risk have been associated with slower blood velocity within large arteries which may confound perfusion results. Kennedy and Raz (2019) found that vascular risk factors, such as ATT, were associated with reduced white matter anisotropy beyond the effects of age. White matter is composed of myelinated axons and deterioration of the white matter is linked to cognitive impairment (O'Brien, 2014) while anisotropy refers to the coherent directionality of water molecules in the brain and plays an important role when it comes to the development of injury (De Erausquin & Alba-Ferrara, 2013). Moreover, delayed ATT is related to greater spatial variance which suggests that individual hemodynamic variables play a larger role in determining perfusion than previously thought (Mustaerts et al., 2016; Mustaerts et al., 2020; Robertson et al., 2017).

Although we did not find a strong correlation between our vascular measures and sCoV in a healthy population, sCoV may still be insightful for those with diseases such as hypertension, which we were unable to capture as one of our exclusion criteria. Limiting the use of vascular risk measures in a healthy population, while excluding those with vascular health defects may explain the weak correlation found in this study. This suggests the need for future research using sCoV as a measure of macrovascular function to consider including using participants that have hypertension or other vascular diseases as this may yield stronger correlations between vascular measures and sCoV.

This study was limited by a small sample size that was composed of healthy older adults. Additional studies that included participants with vascular health issues may yield a larger association between vascular risk factors and sCoV. Given that spatial CoV has shown promise in populations with increased ATT, mainly found in those with hypertension and other diseases, future studies should include both healthy individuals and those with hypertension or other diseases that impact vascular function. Limiting our sample to only cognitively healthy individuals may have contributed to weaker associations between sCoV and measures of executive function; therefore, a population with mild cognitive impairment due to aging may also provide useful insight into the relationship of sCoV and age effect on cognition. Additionally, future studies comparing younger and older participants and their respective levels of sCoV may provide assistance in guantifying cognitive aging. Spatial CoV is limited by its novelty and uncertainty of validity and would benefit from further research in an attempt to confirm that it provides the cognitive and vascular information that it is believed to provide.

Spatial CoV is a novel parameter that was, until recently, disregarded as noise in CBF data and has historically been overlooked as a nuisance in the data and often thrown out. We believe that this measure provides relevant insight that is complementary to our current measures of CBF; however, the novelty of the measure does require caution in its application. The reliability and validity of sCoV have not been thoroughly determined, and additional studies are needed to determine the true value of the measure. With further research, this measure may have important clinical implications as an early diagnostic tool for age-related cognitive impairment such as dementia and Alzheimer's disease.

Conclusion

In characterizing the relationships between sCoV and other variables relevant for cognitive aging, we found that sCoV is correlated positively with age and negatively with a measure of episodic memory performance. This implies that sCoV may be useful in studying the role of vasculature in cognitive aging by reflecting individual differences in ATT which CBF does not account for. In this way, sCoV provides complementary macrovascular information to the microvascular measure of perfusion provided by CBF, which can be unreliable in older adults with vascular pathology.

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Was there a particular experience that sparked your research interests?

My interest in research peaked when I began to plan for a medical aid trip to a rural area in Honduras. I heard about women neglecting available health care and wanted to figure out why. As I began to develop this research project, I discovered my interest in preventative health and have gone on to research the impact of stigma and social influence on vaccination and health service utilization among women.

Who has been the most influential person in your life?

My mom has been the most influential person in my life because she has simultaneously shown me what it looks like to be a strong, smart, independent and hard-working women as well as a tender, compassionate and service-hearted mother and public servant. What is your greatest accomplishment?

My greatest accomplishment must be the relationships I have formed during my college days. While titles and publications are exciting, I am so proud of and thankful for my community and support system. They encourage and enable me to be able to give myself to my community through their love and constant support. Where do you see yourself in 10 years?

In 10 years, I plan to be a practicing physician, although I have not decided the specialty, and to travel on medical aid trips throughout Central America as a bilingual volunteer physician. Also, I would love to have a family of my own!

Applying the Theory of Planned Behavior to Predict CC Screening Behaviors Among Rural Honduran Women

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Cervical cancer (CC) is the second most common cancer and the leading cause of death among Honduran women, yet less than half of them utilize CC screening services. This study determined the psychological attributes influencing CC screening intention and behaviors of rural Honduran women, using the theory of planned behavior (TPB). A sample of 249 women recruited from a community service center completed questionnaires assessing demographics and TPB components (e.g., attitudes, subjective norms, perceived behavioral control). Descriptive statistics, correlations, and structural equation modeling were applied to examine the study variables and evaluate the utility of TPB in predicting CC screening intention and behaviors. The TPB model proved to fit the data well [χ 2 (2) = 2.16, p = .34, CFI = .99, TLI = .99, SRMR = .02, RMSEA = .02], and explained 53% of the variance in intention and behaviors. Attitude, subjective norms, perceived behavioral control, and past behavior were positively associated with the intention to get screened (p < .001), which in turn influenced behaviors (p = .02). However, there was no significant direct influence from perceived behavioral control $(\beta = .03)$ and past behavior $(\beta = .08)$ to actual behaviors. The findings suggest that rural Honduran women's CC screening behaviors tend to be more influenced by their attitudes and their perceived social influence from significant others, rather than their perceived controllability and past behavior of the screening. The findings highlight the importance of developing culturally appropriate TPB-based interventions that can maximize CC screening intention and behaviors among rural Honduran women.

Keywords: Cervical cancer screening, theory of planned behavior, cross-cultural study, public health, preventative healthcare, Latino and Hispanic healthcare.

Cervical cancer (CC) is the most common type of cancer and the leading cause of death among women in the developing world (Arbyn et al., 2020). According to the International Agency for Research on Cancer (IARC, 2018), Latin America and the Caribbean have one of the world's highest incidence and mortality rates for this disease, and these rates are at their highest in the sub-region of Central America. Honduras has the third highest CC incidence in Central America, and CC is the second most common cancer and the leading cause of mortality among Honduran women (International Agency, 2014; Human Papillomavirus [HPV] and Related Disease Report; 2019). Current estimates indicate that 14.7% of women in the general population of Honduras either have an HPV-16 or an HPV-18 infection at a given time, and 53.5% of invasive CCs in Honduras are attributed to HPVs 16 or 18 (ICO/IARC Information Centre on HPV and Cancer, 2019). Despite these high CC incidence and mortality rates, the majority of women in Honduras, especially those living in rural areas, have not received screening for early detection and/or prevention of CC. Recent estimates show that only 42% of Honduran women reported ever having a CC screening (Pryor et al.,

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Cervical cancer (CC) is the most common type of cancer and the leading cause of death among women in the developing world (Arbyn et al., 2020). According to the International Agency for Research on Cancer (IARC, 2018), Latin America and the Caribbean have one of the world's highest incidence and mortality rates for this disease, and these rates are at their highest in the sub-region of Central America. Honduras has the third highest CC incidence in Central America, and CC is the second most common cancer and the leading cause of mortality among Honduran women (International Agency, 2014; Human Papillomavirus [HPV] and Related Disease Report; 2019). Current estimates indicate that 14.7% of women in the general population of Honduras either have an HPV-16 or an HPV-18 infection at a given time, and 53.5% of invasive CCs in Honduras are attributed to HPVs 16 or 18 (ICO/IARC Information Centre on HPV and Cancer, 2019). Despite these high CC incidence and mortality rates, the majority of women in Honduras, especially those living in rural areas, have not received screening for early detection and/or prevention of CC. Recent estimates show that only 42% of Honduran women reported ever having a CC screening (Pryor et al., 2017), compared to 81.1% of women in the United States (U.S.; National Institute of Health [NIH], 2020). Honduras is a developing country facing tremendous challenges in delivering healthcare to rural regions, and multiple factors may have contributed to low screening numbers within this population (Onega et al., 2016). Many women, for example, experience several barriers to healthcare access such as lack of transportation. Rural women in Honduras report the need to travel by foot, and for many hours, to receive medical attention. Unfortunately, the reasonable lack of motivation to overcome these and other obstacles to access medical attention could be a large reason why this population has not been screened as frequently for CC (Onega et al., 2016).

CC screenings are predominantly responsible for the decreased incidence and mortality of CC among women around the world (Landy et al., 2016; Roncancio et al., 2015; Vicus et al., 2014). Since most CC can be prevented through routine CC screenings and successfully treated if detected early (Centers for Disease Control and Prevention, 2014), encouragement of screening among Honduran women is vitally important. Regular Papanicolaou (Pap) smear screenings, although at times uncomfortable, are relatively painless procedures that can prevent CC by detecting treatable precancerous abnormalities and lesions before they become cancerous (Crosbie, 2018). Cancer screening guidelines strongly suggest that women get a Pap smear every three years from the ages of 21-65, with more frequent testing if abnormalities are found, and end CC screening at the age of 65 only if they have maintained a regular screening schedule for the last 10 years and precancers have not been found in the last 20 years (Lindenberg Cancer & Hematology Center, 2021). Following the suggested

guidelines greatly reduces the probability of a fatality from cervical cancer and is highly important to realize adequate public health standards.

Increasing participation in CC screening among Honduran women should decrease the occurrence and fatality of CC by enabling early diagnosis and treatment. Yet, in order to increase screening participation, discerning which factors are most influential in predicting screening behavior is necessary to develop the appropriate interventions that increase adherence to CC screening (Walker et al., 2006). A few studies have explored factors influencing the CC screening behaviors of Honduran women, especially those living in rural areas (e.g., Garrett & Barrington, 2013; Onega et al., 2016). However, to the best of our knowledge, previous research has not examined the CC screening behaviors of Honduran women applying established health behavior models or theories. By incorporating existing models or theories, which have a substantial role in explaining phenomena under study, we can better understand the factors that underlie women's intentions to engage in CC screening behavior (Radecki-Breitkopf & Pearson, 2009; Roncancio et al., 2013). Accordingly, this study aims to explore psychological attributes influencing CC screening intentions and behaviors of women living in rural Honduras, using the existing theory of planned behavior (TPB) (Ajzen, 1991).

Overview of the Theory of Planned Behavior

The TPB was originally derived from the expectancy-value model, which encompasses an individual's motivation, expectations, and goals. It is a cognitive-motivational health behavior model that encompasses three main components to explain behavioral intentions and, subsequently, one's likelihood to partake in a certain health behavior. These three main components include attitudes (the extent to which the participant views the expected outcome as positive or negative), subjective norms (the normative code of behavior in a large group context), and perceived behavioral control (one's perceived ability to execute the behavior). The TPB posits that these three components can predict a person's behavioral intentions, and in turn, their behavioral intention directly influences the likelihood of completing the behavior (Francis et al., 2004).

As a general rule, the more positive the attitude and subjective norm, and the greater the perceived control, the stronger should be an individual's intention to actually perform the corresponding behavior. Attitudes are a function of an individual's salient behavioral beliefs that represent, in part, the perceived likely positive (or negative) consequences of the behavior (e.g., obtaining a CC screening can detect CC early). Subjective norms are a function of normative beliefs, which tend to be based on specific, salient perceptions of others' preferences about whether one should engage or not in a particular behavior (e.g., my husband thinks I should get a CC screening). Finally, perceived behavioral control is based on beliefs concerning access to the necessary resources and opportunities to perform the behavior successfully (e.g., I can easily access a clinic where I can get a CC screening). If a patient does not feel like they could obtain adequate and/or helpful treatment for an illness, it may not logically follow to seek diagnosis.

Several studies have successfully used the TPB to predict and explain various health- related behaviors, such as seeking general health care services, obtaining breast and colorectal cancer screenings, and engaging in physical activity (LaMorte, 2019; Sheeran et al., 2001). A meta-analysis comparing the utility of different well-known theories and models, such as the Health Belief Model and Social Cognitive Theory, has revealed that the TPB appears to show the strongest and most consistent predictive ability of health behavior intentions, compared to other theories and models (Conner et al., 2000). Of interest to the current study, the TPB has specifically modeled CC screening intentions and behaviors in various cultures. That is, several studies have successfully predicted CC screening behavior among different populations with various cultural backgrounds, including Latina women in the U.S. (Roncancio et al., 2015) and women in Iran (Jalilian & Emdadi, 2011), Ethiopia (Abemacha, et al., 2019), and Indonesia (Anggraeni et al., 2016), to name a few examples. A study of interest that applied an expanded model of the TPB (Roncancio et al., 2015) found that not only the TPB components, but other variables (e.g., culture) also played a significant role in predicting CC screening. This finding highlights the importance of taking into account additional components along with subjective norms, attitudes, and perceived behavioral control in exploring the role of TPB on CC screening intention and behaviors.

As the aforementioned results suggest, the TPB may provide health providers with valuable information on the relative importance that attitudes, subjective norms, and perceptions of behavioral control may have on the prediction of CC screening intentions and actual behavior. For example, consider a case where attitudes would be a better predictor of CC screening intentions and behavior than subjective norms and perceptions of behavioral control; it would seem reasonable to direct interventions, such as group educational opportunities, at modifying attitudes towards CC screening in an attempt to make attitudes more favorable, thus affecting intentions and behavior.

As a model, TPB is consistent across cultures, but the fact that certain factors change in strength across cultures and can reveal culturally significant differences cannot be denied. Although the TPB has shown to be reliable and consistent in its applicability, researchers have still found variability in predicting and/or explaining health behaviors using this model due to variations across different cultures on the importance given to attitudes, subjective norms, and perceived behavioral control (Walker et al., 2006). In addition, methodologies and the approach toward topics of interest when using this particular health behavior model have necessitated culturally specific adaptations to produce equivalency among different populations (Beaton et al., 2000). To this end, exploring health behaviors such as CC screening behaviors using the TPB in different cultural contexts and groups is important to improve public healthcare, particularly in regions where less is known about the extent to which the TPB components affect behavioral intentions and subsequent behaviors. By grounding this research in a theory-based approach, we intend to add to current literature by providing a greater understanding of the complex phenomena under investigation and the foundations for the development and implementation of intervention strategies that facilitate preventive behaviors such as CC screening (Polit & Beck, 2017). To the best of our knowledge, no previous research has incorporated the TPB to explore the underlying factors that are most pertinent to predicting CC screening intentions and behaviors in a rural region of Honduras where CC screening rates are particularly low.

The current investigation not only aims to establish the applicability of the TPB in Honduras, but also aims to identify which factors are the most important for predicting screening behaviors in a region where screening rates are particularly low. Based on the premise that the TPB constructs have consistently predicted a wide range of health behaviors, including CC screening in Latina and Mexican women of similar cultural demographic backgrounds as women in Central America (Fernandez-Esquer, 2003), we can reasonably assume that the TPB will significantly predict CC screening intention and behaviors among women of rural Honduras. More specifically, we expect that attitudes, subjective norms, and perceived behavioral control would predict behavioral intentions to receive a CC screening and, subsequently, actual screening behavior in a sample of rural Honduran women.

Methods

Participants and Procedure

A total of 249 women living in a rural area in Honduras were recruited to participate in this study. All participants were recruited during a temporary medical aid clinic that offered various free medical services, including Pap smear screening services after general consultation. Women were approached and asked to participate in this study as they waited for their consultation after completing a generic medical triage to enter the clinic. Women were selected to participate in this study if they were 18 years of age or older and able to understand and speak Spanish. A native Spanish speaker trained by the primary researcher approached the women visiting the temporary medical aid clinic, asked whether they were eligible to participate in this study, and, if eligible, administered a survey questionnaire to them. To avoid miscommunication, we had native speakers trained by the primary researcher to distribute and/or read the consent form to the women and ask them to voluntarily complete the questionnaire without compensation. For those who were illiterate, native speakers orally administered the questionnaire. This study was conducted with the approval from the University of Oklahoma Institutional Review Board. All participants completed an informed consent form prior to partaking in the study in accordance with APA ethical standards.

Measures

All measures used in the study were adopted from previous literature and designed to be appropriate for the current study's aims. They were created and reviewed by the entire research team and translated to Spanish from an original English version by one of the researchers in this study. A team of local health professional employees of the organization that hosted the clinic in Honduras reviewed and revised all the measures to ensure that they were ethical and culturally-sensitive.

Attitudes

Attitudes toward CC screening were measured using 14 items. All items in this scale loaded significantly onto the latent attitudes factor (all p < .001). The scale included items such as "A Pap Smear is necessary" and "A Pap Smear will threaten my privacy." Participants responded on a Likert-scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The reliability for this scale was acceptable (Cronbach's $\alpha = .72$).

Perceived Behavioral Control (PBC)

To create a scale of perceived behavioral control, we used 10 items to create a latent PBC factor. All items loaded significantly onto the latent factor (all p < .001). This scale included items such as, "I am confident that I can schedule a Pap Smear appointment and keep it," and "I would find it easy to follow up on recommended treatments resulting from a Pap Smear." Participants responded on a Likert-scale from 1 (Strongly disagree) to 5 (Strongly agree). The reliability for this scale was satisfactory (Cronbach's α = .84).

Subjective Norms (Social Influence)

To create a scale of social influence, we used six items. Participants responded on a Likert-scale from 1 (Strongly disagree) to 5 (Strongly agree) to items such as, "My family thinks I should have regular Pap Smears," and, "My closest friends think I should have regular Pap Smears." The reliability for this scale was satisfactory (Cronbach's $\alpha = .83$).

Behavioral Intentions (Intent)

To create a scale of CC screening behavioral intentions, we used three items to create a latent Intent factor. All items loaded significantly onto the latent factor (all ps < .001). This scale included items such as, "I intend to have a Pap Smear in the next year," and "I will continue to follow recommended, routine Pap Smears." Participants responded on a Likert-scale from 1 (Strongly disagree) to 5 (Strongly agree). The reliability for this scale was satisfactory (Cronbach's α = .87).

CC Screening Behavior

In order to assess whether or not women would receive a screening, we used a single item, asking women, "Are you getting a Pap Smear today?" Women responded on a binary scale (1 = Yes, 2 = No). Although it does not measure actual behavior, we used this measure as a proxy of behavior, since women attending the aid clinic had a clear understanding of the services offered by the clinic and what services they wanted to obtain during their visit. TPB studies that use a cross-sectional design (like the current study) are not able to measure actual behavior. This is only possible if there is a follow-up point on the data collection. Thus, most previous cross-sectional studies focusing on the applicability of the TPB have used participants' intention to engage in the behavior or past behavior as a proxy measure of actual behavior (Roncancio et al., 2013). We use a similar approach in this study by measuring participants' decision to obtain a Pap smear that same day as a proxy measure of their actual behavior.

CC Screening Past Behavior

CC screening past behavior was assessed with a single item that asked women, "Have you had a Pap Smear in the past three years?" Women responded on a binary scale (1 =Yes, 2 =No).

Data Analysis

All preliminary data analyses were conducted using the SPSS statistical software (Version 27.0). Descriptive statistics were applied to obtain information about the demographic characteristics of the sample and to examine the distributions of the TPB components (i.e., attitudes, subjective norms, perceived behavioral control, and intention). Correlation coefficients and Cronbach's alpha were obtained to determine the relationship across the study variables and estimates of reliability of the TPB components, respectively. All subsequent analyses were conducted using Mplus statistical software (Version 8.3: Muthen & Muthen, 2018) to determine whether the TPB components predicted CC screening intention and behavior among rural Honduran women. The degree to which the TPB model fits the data was estimated using the following parameters: (a) relative chi-square statistic (x2/df ratio), (b) comparative fit index/Tucker–Lewis index (CFI/TLI), (c) root mean square error of approximation (RMSEA), and (d) standardized root mean square residual (SRMR). Although there are no clear cutoff criteria for accepting a model as appropriate, it is generally agreed in the literature that (a) a value of χ^2/df less than 3 is acceptable; (b) values of the CFI/ TLI greater than 0.95 are considered excellent model fit, and those between 0.90 and 0.95 are acceptable; (c) values of the RMSEA less than 0.05 indicate excellent model fit, values of 0.05-0.08 are acceptable, and values greater than 1.00 indicate poor fit, and (d) values of the SRMR less than 0.08 are considered acceptable (Bentler, 1990). The 2-path mediated direct and indirect effects from the TPB components through intention to predicted behavior are indicated in Figure 1.

Results

Sample Characteristics

Women in the study were, on average, 35 years old (SD = 12.40), with ages ranging from 18 to 76 years old. The majority of women were married or in a relationship with their partner (77%), sexually active (68%), and had at least one or more children (93%). Most women indicated that they were comfortable around doctors (96%), trusted their doctors (97%), rated their accessibility of health care services/resources good or very good (79%), but worried about payment of doctor visits (98%). Approximately 67% of women indicated that they have had a CC screening within the past three years and 30% of women indicated that they were going to get a screening on the day the survey was conducted. It is important to specify that these percentages were overlapping. That is, some women who have had a CC screening in the past three years (30% of the sample) have also decided to have a CC screening during the day the survey was conducted. Table 1 provides detailed information about characteristics of the participants.

Relationship Between TPB Components and CC Screening Intention and Behaviors

A series of correlations revealed that there was a positive relationship between intention and attitudes (r = .59, p < .001), subjective norms (r = .35, p < .001), and perceived behavioral control (r = .45, p < .001). In turn, intention was positively related to behaviors (r = .48, p < .001). This indicates that women who hold a positive attitude, more social pressure from significant referents (e.g., husband/partner), and high levels of confidence (i.e., PBC) toward CC screening uptakes were likely to intend to obtain the screening, which ultimately led to actual behaviors of the screening. Women who were sexually active were more likely to hold a positive attitude (r =.26, p < .001), social pressure (r = .26, p < .001), and intention (r = .31, p < .001) to obtain CC screening. Importantly, women's past history of CC screening was positively associated with all four TPB components (i.e., attitudes, subjective norms, PBC, and intention: r = .25 - .52, p < .001).

To assess the reliability of TPB in predicting CC screening intention and behavior, all four TPB components were included into the model and estimated using Mplus. As posited by Ajzen (1991), indirect paths were structured from attitudes, subjective norms, and PBC to behavior via intention, and direct path was structured from PBC to behavior. Indirect paths depict causal effects of prior variables onto subsequent variables that transit through one or more mediating variables; whereas direct paths depict causal effects directly flowing from prior variables onto subsequent variables (Kline, 1998). Additionally, a past behavior variable (i.e., history of CC screening within the past three years) was added in the model to determine its effect on intention and behavior. The variable was added because (a) Ajzen (1991) posits that a past behavior is one of the best predictors of future behavior and can be used to better comprehend the sufficiency and predictive accuracy of the TPB, and in fact (b) our data show that the past behavior had significant correlations with all four TPB components.

The result of Mplus revealed that the model fit the observed data adequately $[\chi^2 (2) = 2.16, p = .34, CFI = .99, TLI$ = .99, SRMR = .02, RMSEA = .02, 90% CI = 0.000 to 0.130]. The model explained 50% of the variance in intentions to receive a CC screening and an additional 3% of the variance in actual behaviors of CC screening. As postulated, all direct path coefficients among the TPB components, which are the paths from attitudes, subjective norms, and PBC to intention (β = .41, p < .001; β = .17, p < .001; β = .21, p < .001, respectively), and from intention to behavior $(\beta = .18, p = .02)$ were significant. The only path that was not significant was the direct path from PBC to behavior $(\beta = .03, p = ns)$. The direct path from past behavior to intention (β = .22, p < .001) was significant, while the direct path from past behavior to behavior was not significant (β = .08, p = ns).

To determine specific indirect pathways, we utilized the bootstrap resampling method for confidence intervals (CIs) of the indirect effects, which are interpreted to be significant at p < .05 if the interval does not contain the integer 0. This method was utilized due to the superiority of bootstrapping to other confidence interval estimation methods (MacKinnon et al., 2004; Williams & MacKinnon, 2008). The analysis revealed that the 2-path mediated effect, from Attitudes through the Intention variable, was significant (Mediated Effect [ME] = .07, SE = .03, 95% CI [-.136, -.008], p = .03). The 2-path mediated effect from Subjective Norms to Behavior through the Intention variable was also significant (ME = .03, SE = .02, 95% CI [-.060, .001], p = .05). The 2-path mediated effect from PBC to Behavior through Intention was significant (ME = .04, SE = .02, 95% CI [-.073, -.001], p = .04). Finally, the 2-path indirect effect from Past Behavior to Behavior through Intention was significant (ME = .04, SE = .02, 95% CI [.001, .076], p = .04).

Discussion

The current study investigated the application of the TPB (Ajzen, 1991) in a previously unexamined cultural group in rural Honduras. More specifically, we examined whether the TPB significantly predicted CC screening intention and behavior in rural Honduran women and attempted to identify which factors seemed to most heavily influence intention and behavior to receive a Pap smear. Our intention was to identify influential factors that are indicative of the most profitable areas to target for adjustments in preventative healthcare in Honduras., This is the first study to use the TPB to predict CC screening intentions and behavior among women in rural Honduras. Overall, the results of the study provide support for the use of the TPB in predicting CC screening intentions and behavior among rural women in Honduras. The model used in our study explained 50% of the variance in CC screening intention, which is consistent with the average of variance obtained in studies that have previously used the TPB (Sutton, 1998). The analysis revealed that attitudes are the strongest predictor of intentions followed by past behavior, perceived behavioral control, and subjective norms. We believe that attitudes may be the strongest predictor because they most directly represent the women's emotional and intellectual schema of the screening procedure, including its personal utility and importance to them. This finding suggests that health care providers need to develop intervention strategies that target women's changes in their attitude toward CC screening by reinforcing positive aspects of CC screening (e.g., health benefits of CC screenings). Although our measure of behavior did prove to be significant in our model through indirect effects, our model explained only 3% of the variance of behavior. This percentage is below the variance explained in past TPB research (i.e., 19% to 38%). It should also be noted that CC screening rates of rural Honduran women who participated in this study (i.e., 67%) were higher than the screening rates (i.e., 42%) of Honduran women in general. This discrepancy might be, in part, due to geographic regions covered in the study (i.e., one local area versus nationwide area with more variability in CC screening rates), or the results of cancer prevention initiatives available in this particular rural area (e.g., temporary medical aid clinic offering free screening services). Regardless of this plausible speculation, further research is warranted.

Although the measure used to assess behavior only assessed whether participants had made the decision to obtain the CC screening on that precise day, this measure is a good proxy of actual behavior (Ajzen, 1985). Consistent with this view, previous research has shown that the shorter the period between the measure of the intention to engage in a particular behavior and the actual behavior, the stronger the intention-behavior relationship is (Ajzen, 1985; Randall & Wolf, 1994). Nevertheless, the use of this measure to assess behavior is certainly a limitation of this study. Future longitudinal studies in which participants' screening behavior could be traced over an extended period of time, including multiple years, may be able to predict long-standing screening behavior based on the TPB model. The use of a single item for the measurement of participant's actual CC screening behavior could also be considered as a limitation. From a practical point of view, single-item measures may be appealing and easy to use, but they may not capture a broader range of meaning about the construct under study (Hoeppner, et al., 2011).

The current study provides the first piece of evidence supporting the application of the TPB in rural Honduran populations in regard to CC screenings and suggests that perceptions of screenings, perceived behavioral control, and social support for attending screenings may be critical for ensuring rural Honduran women attend screenings. Given these findings, Pap smear participation may be increased in the future by reinforcing positive representations of CC screening through educational interventions, which have shown to be highly effective in increasing positive attitudes towards CC screenings in prior research (Naz et al., 2018). For example, clinicians could focus on intentionally informing their patients and disseminating educational information about the benefits, importance, and normality of the procedure.

Secondly, the data also indicated a significant correlation between social influence, intention to be screened, and actual behavior. This significant correlation means that women who believed that people "important to them" supported their participation in Pap smear screenings were more likely to express intention to be screened and to follow through with the behavior. While future interventions should consider targeting social relationships to assure Honduran women that they are supported by their loved ones in receiving a Pap smear test, the current study does not specifically address which social influence may be most important given the broad nature of the social influence prompt in the current study. While some studies suggest support from one's spouse or partner is critical to encourage screenings (Hou, 2006; Winkler et al., 2008), other studies suggest that peer support is crucial as well (Documet et al., 2015; Logan & McIlfatrick, 2011). Future research should attempt to address this nuance to establish which influence group is most important for rural Honduran women.

In previous studies that applied the TPB to specific cultural groups, the TPB provided a good framework to predict intentions, and an extended, modified version

significantly predicted participants' intentions in multiple cultural groups (Chudzicka-Czupała et al., 2016; Di Sarra et al., 2015; Roncancio et al., 2015). Nevertheless, prior researchers have encouraged further investigation into the cross-cultural application of the TPB, as significant cross-cultural differences have emerged in multiple studies (Chudzicka-Czupała et al., 2016; Hagger et al., 2007; Van Hooft et al., 2006; Walker et al., 2006). A meta-analysis of 185 studies on the TPB shows that the model explains, on average, 27% of the variance in behavior and 39% of the variance in CC screening intentions (Armitage & Connor, 2001). Based on the results of our study, we feel confident that the model used in our study provides further support for the cross-cultural validity of the TPB.

Our results are consistent with similar studies among Latina women in the United States, which have concluded that the TPB is useful in predicting CC screening intention and behavior in Latina women (Roncancio et al., 2013; Roncancio et al., 2015). While previous studies among Latina women in America found that intentions were most strongly predicted by perceived behavioral control, in our current study, perceived behavioral control was superseded by attitudes (Roncancio et al., 2013; Roncancio et al., 2015). These findings are surprising given that the sample was collected from a medically underserved community in Honduras, where one might suspect aspects of perceived behavioral control would be strong predictors of CC screening intentions. One explanation for this finding is that rural Honduran women's sense of control over the screening may not be of primary concern and that both social influence and positive attitudes are the two aspects Honduran women rely upon when deciding whether or not to be screened. Studies on women in rural populations may provide some support for this explanation. For example, in a qualitative study of rural Appalachian women, Schoenberg and colleagues (2006) found that some women displayed a sense of apathy towards attending CC screenings because they simply might not have the resources to plan appointments, coordinate transport to the doctor's office, or even ensure that a doctor will be available in a reasonable time frame for them.. This view is consistent with findings that suggest that rural Honduran women who objectively lack resources to access health care sites are less motivated to seek CC screening (Onega et al., 2016). While lack of funding and resource access in rural communities is problematic and is likely creating a complete lack of control regarding women's CC screening decisions, future developments designed to increase CC screening participation in rural Honduras could surely focus on targeting these and other factors that affect social influence and personal attitudes.

Conclusion

We believe that this study provides health providers

with important insight, as the results can be used to develop and implement new methods that increase the intention to be screened among women in Honduras. We have applied a widely accepted health model to better understand and predict CC screening and behavior in a previously under-studied population of women, providing a cross-cultural validation of the TPB. The TPB allowed us to understand a critically important public health issue and identify factors (attitudes and social influence) that can be targeted to increase CC screening in rural areas of Honduras. In regards to public health in Honduras, it is crucial to begin incorporating extensively supported theoretical frameworks to new CC screening programs in order to maximize the beneficial impact of increased screening participation. CC is a preventable yet potentially fatal disease (Centers for Disease Control and Prevention, 2014), and the present study provides exciting and useful information to begin implementing effective CC interventions among women in a heavily affected population in rural Honduras.

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Appendix

Figure 1

Theory of Planned Behavior (TPB; Ajzen, 1991) Incorporated with the Past Behavior Variable.



Note. Direct path depicts causal effects directly flowing from prior variables onto subsequent variables; indirect path depicts causal effects of prior variable onto subsequent variables that transit through one or more mediating variables (Kline, 1998). * p < .05

Table 1

Sample Characteristics (N = 249)

Characteristics	n (%) or M ± SD
Age, y (N = 249)	35.11 ± 12.40
Marital status (n = 249)	
Single	48 (19.3)
Married or Relationship	193 (77.5)
Other	8 (3.2)
Any Formal Education ($n = 242$)	
Yes	209 85.7)
No	33 (13.5)
Sexually Active (n = 231)	
Yes	156 (67.5)
No	75 (32.5)
Have Kids (n = 247)	
Yes	230 (93.1)
No	17 (6.9)
Heard of a Pap Smear ($n = 248$)	
Yes	228 (91.9)
No	20 (8.1)
Ever Had a Pap Smear (n = 249)	
Yes	197 (79.1)
No	52 (20.9)
Had a Pap Smear within the Past 3 Years	
Yes	166 (66.7)
No	83 (33.3)
Comfortable around Doctors (n = 240)	
Yes	230 (95.8)
No	10 (4.2)
Trust Doctors (n = 240)	
Yes	233 (97.1)
No	7 (2.9)
Accessibility of Health Care Services	
Poor/Very Poor	18 (7.4)
Good/Very Good	191 (78.6)
Worry about Payment Of Doctor Visits	
Yes	219 (89.8)
No	25 (10.2)
Receiving a Pap Smear Today	
Yes	72 (29.5)
No	172 (70.5)

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Table 2

Measures Used in the Questionnaire

Please answer the following questions by writing your response or circling the right answer

1.	What is your age	
2.	What is your relationship status?	
	1. single in a relationship 5. divorced	2. married 3. widowe
3.	Do you smoke? 1. YES	2. NO
	If yes, how many cigarettes per day?	
4.	Do you have children? 1. YES	2. NO
	If yes, how many?	
5.	Have you had any formal education? 1. YES	2. NO
6.	How old were you when you stopped going to school?	
7.	What is the highest degree of education you completed?	
8.	Do you have access to a landline and/or cellular phone? 1. YI	ES 2. NO
9. 2. N	Do you have access to transportation into a community to get a O	cancer screening? 1.
10.	How often do you see a doctor?	
11.	Are you comfortable around doctors?	1. YES 2. NO
12.	Do you trust doctors? 1. YES	2. NO
13.	Do you understand doctor's instructions clearly? 1. YES	2. NO
14.	Do you worry about paying for your visits to the doctor?	1. YES 2. NO
15.	Have you heard of a Pap Smear before?	1. YES 2. NO
16.	Do you know the purpose of a Pap Smear?	1. YES 2. NO
17.	Have you ever had a Pap Smear?	1. YES 2. NO
18.	Have you had a Pap Smear in the past 3 years?	1. YES 2. NO
19.	Has anyone you know had a Pap Smear before? 1. YES	2. NO
20.	Have you heard of the term, "cervical cancer" before? 1. YES	S 2. NO

	If yes, who told you about it?		
	 spouse/partner friend family member other 	4. a doctor 5.6. co-worker	
21.	Do you know how cervical cancer fatality can be prevented? 1.	YES2. NO	
22.	Are you getting a Pap Smear today? 1. YES	2. NO	
23.	Would you get a Pap Smear regularly as recommended if they w	vere free? 1. YES	2. NO
24.	Are you sexually active? 1. YES	2. NO	
25.	Do you use condoms? 1. YES	2. NO	
26.	How would you rate your health in general?		
	1. very poor 2. poor 3. good 4. very good		
27.	How would you rate your access to healthcare services and/or re-	esources?	

1. very poor 2. poor 3. good 4. very good

Pap smears are used by doctors to detect cervical cancer. Below are some statements regarding your beliefs about Pap Smears. Please read each statement carefully and provide your response to each statement using the following scale:

1= strongly disagree	2= disagre	ee
	3=agree	4=strongly
agree	5= I am n	ot sure

- 1. _____ My family thinks I should have regular Pap Smears.
- 2. _____ My closest friend thinks I should have regular Pap Smears.
- 3. _____ My doctor thinks I should have regular Pap Smears.
- 4. _____ My religious groups think I should have regular Pap Smears.
- 5. _____ My husband/partner thinks I should have regular Pap Smears.
- 6. _____ Most people who are important to me think that I should have regular Pap Smears.
- 7. _____ I am confident that I can go get my next Pap Smear.
- 8. _____ I am confident that I can schedule a Pap Smear appointment and keep it.

9.	I am confident that
I can keep having routine Pap Smears, even if I had to go	to a clinic outside my community in
order to get one.	

10. _____ I am confident that I will pursue recommended treatments resulting from a Pap Smear.

11. _____ I am confident that I can prevent cervical cancer by having a Pap Smear.

12. _____ I would find it easy to obtain a Pap Smear.

13. _____ I would find it easy to schedule a Pap Smear appointment and keep it.

 I would find it easy to follow up on recommended treatments resulting from a Pap Smear.

- 15. _____ I would be able to travel outside of my community to obtain a Pap Smear.
- 16. _____ I have complete control over having a Pap Smear in the next year.
- 17. _____ A Pap Smear will be painful.
- 18. _____ A Pap Smear is necessary.
- 19. _____ A Pap Smear will not benefit me.
- 20. _____ It would be too embarrassing to have a Pap Smear.
- 21. _____ A Pap Smear will not benefit my husband or partner.
- 22. ____ Getting a Pap Smear would only make me worry.
- 23. _____ A Pap Smear would make me uncomfortable.
- 24. _____ I would be showing self-love by getting a Pap Smear.
- 25. _____ I would be taking care of myself by getting a Pap Smear.

 Knowing the results of my Pap Smear would make me more confident to engage in sexual activity.

- 27. _____ Knowing the results of my Pap Smear would give me peace-of-mind.
- 28. _____ A Pap Smear will threaten my privacy.
- 29. ____ A Pap Smear is useless.
- 30. _____ It would be pleasant to undergo a Pap Smear.
- 31. _____ A Pap Smear is reliable.

- 32. _____ I intend to have a Pap Smear in the next year.
- 33. _____ I will get a Pap Smear, even if I have to leave my community to find a clinic.
- 34. ____ I will get a Pap Smear regardless of proximity to a clinic.
- 35. _____ I will continue to follow recommended routine Pap Smears.
- 36. _____ I will schedule an appointment for a Pap Smear and keep it in the next year.

Casandra J. Gomez Alvarado, BA University of California, Los Angeles

Casandra J. Gomez Alvarado graduated with departmental highest honors from UCLA with a Bachelor of Arts in Psychology and a minor in Applied Developmental Psychology. As an undergraduate, Casandra was a research assistant in Dr. Jennifer Silver's Social Affective Neuroscience and Development (SAND) Lab. She was also a research assistant in Dr. Denise Chavira's Culture and Anxiety Lab for Mental Health Advances (CALMA) where she completed her honors thesis. After graduating, she worked as a research coordinator in Dr. Anna Lau's Culture and Race/Ethnicity (CARE) in Youth Mental Health Lab. Casandra is now pursuing her PhD in Clinical Psychology at the University of North Carolina, Greensboro under the mentorship of Dr. Gabriela Livas Stein.



Was there a particular experience that sparked your research interests?

There are ample examples that highlight the need for accessible and equitable mental health care, particularly among youth, that influence my research interests. As a clinical psychologist, I am interested in improving psychological well-being among youth and understanding the role of culture, the brain, and psychophysiology in mental health disorders and resilience. My goal is to improve mental health services and reduce disparities.

Who has been the most influential person in your life? Many people have been influential in my life, but I am particularly inspired by my siblings every day. They encourage and support me to do the best I can and they are a great example of putting your heart into everything you do. What is your greatest accomplishment?

Having the opportunity to attend graduate school to obtain a PhD in Clinical Psychology is an accomplishment I am incredibly excited about. I look forward to conducting research and becoming a clinician as part of the CAMINOS Lab, my new home at UNCG.

Where do you see yourself in 10 years?

In 10 years, I will be very excited to have obtained my PhD in Clinical Psychology and I hope to hold a role where I am able to continue to work towards improving mental health services.
The Role of Resilience and Extracurriculars on the Relationship Between Family Conflict and Internalizing Symptoms in Predominantly Rural Latinx Youth

Casandra J. Gomez Alvarado, Carolyn Ponting, and Denise A. Chavira Department of Psychology, University of California, Los Angeles

Internalizing disorders such as depression and anxiety are common, affecting 22% of adolescents in the United States (Merikangas et al., 2010). Rural context and Latinx ethnicity are demographic factors associated with higher rates of internalizing disorders in youth, as compared to their counterparts from other ethnicities and urban contexts (Anderson & Mayes, 2010; Probst et al., 2006). This study conducted a risk and resilience survey among 601 predominately Latinx adolescents (M age = 15.79, SD = 1.21, 55% females) at a public high school in a rural community. A moderated mediation model was utilized to examine the extent to which personal resilience mediated the relationship between family conflict and internalizing symptoms. Further, we examined whether extracurricular (EC) activities (system-level resilience factors in the child's environment) moderated the relationship between family conflict and personal resilience in predominantly rural Latinx youth. Results revealed that our overall model was significant and confirmed personal resilience as a mediator, though we found no moderating effect of ECs. Thus, higher levels of family conflict were related to higher levels of internalizing symptoms by way of reduced resilience; ECs were unrelated to any other variables in the model. Our results support a growing literature on personal resilience as an intervention target for underserved youth with internalizing symptoms.

Keywords: rural Latinx youth, resilience, internalizing symptoms, anxiety, depression, family conflict

Internalizing disorders typically occur in late childhood or early adolescence and cause clinically significant impairments in approximately 22% of adolescents in the United States (Merikangas et al., 2010). Internalizing disorders refer to disturbances in emotions and moods which can be typically observed in disorders such as anxiety and depression (Zahn-Waxler et al., 2000). Common internalizing symptoms include sadness and fear; when impairing, these symptoms can contribute to depression and anxiety, respectively (Zahn-Waxler et al., 2000). Functional impairments associated with internalizing disorders often include poor school performance and difficulty with the establishment and development of meaningful social relationships (Langley et al., 2004). Internalizing disorders are of particular concern among rural Latinx youth. In rural areas, depression (Probst et al., 2006) and suicide are significantly higher for adolescents and young adults than their counterparts in urban communities (Fontanella et al., 2015). Alarmingly, rural-urban disparities in suicide rates have increased over time (Fontanella et al., 2015). Further, in a review examining the prevalence of internalizing disorders in youth by race and ethnicity, Anderson and Mayes (2010) found that Latinx Americans had higher anxiety sensitivity, as well as higher rates of clinically significant anxiety in comparison with European Americans. Latinx youth also report higher rates of depressive symptoms than do youth of Asian, African American, or European descent, irrespective of socioeconomic

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We have no conflicts of interest to disclose.

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status (Céspedes & Huey, 2008; McDonald et al., 2005; Umaña-Taylor & Updegraff, 2007).

Rural Latinx youth likely encounter varying stressors that contribute to a heightened risk for internalizing problems. In rural communities, there is a significant disparity between the need for mental health services and the services available (Lenardson et al., 2010; Saxena et al., 2007; Wang et al., 2005). For example, Lenardson and colleagues (2010) report that 5.8% of children living in rural areas experience mental health problems as opposed to 5.3% of children in urban areas, a difference they found to be significant. They also found that children in rural areas were less likely to have access to mental health care resources than those in urban areas (Lenardson et al., 2010). Despite the elevated rates of internalizing problems evident in the higher rates of suicide among rural-dwelling youth (Fontanella et al., 2015), rural youth access treatment for mental health problems approximately 20% less than their urban counterparts (Lenardson et al., 2010). This is in part due to contextual barriers like geographic isolation. In addition to concerns common to rural communities (e.g., poverty and lack of access to resources; Kuperminc et al., 2009; Probst et al., 2004; Stacciarini et al., 2015), culturally related stressors, such as discrimination, migration, and intergenerational family conflict, are also salient among Latinx youth (Romero & Roberts, 2003). Taken together, the extant literature suggests that rural Latinx youth experience higher rates of internalizing distress and are less able to access appropriate mental health care.

In this article, we are interested in examining both risk and protection from internalizing psychopathology in predominantly rural Latinx adolescents. One approach to examining risk and protective factors as they relate to psychopathology is a conceptual model that characterizes the relationship between these constructs proposed by Grant and colleagues (2003). The model suggests that (a) persistent stressors are associated with psychopathology, (b) moderators can be conceptualized as protective factors (i.e., environmental influences) that influence the relationship between stressors and psychopathology, and (c) mediators can also be conceptualized as psychological processes that can account for the relation between stressors and psychopathology (Grant et al., 2003). We will measure persistent stress, individual level psychological resources, and environmental contexts to better understand how predominantly rural Latinx youth may develop internalizing distress. This approach is consistent with the modeling of mechanisms of risk in adolescent psychopathology proposed by Grant and colleagues (2003).

Family Conflict and Increased Internalizing Disorders

We classify family conflict as a persistent stressor that is robustly associated with adverse mental health outcomes.

For example, after controlling for socioeconomic status and parenting practices, as little as one reported instance of interparental conflict showed enduring associations with internalizing and externalizing problems in a sample of 3,696 children and mothers (Westrupp et al., 2018). Further, children exposed to interparental conflict, such as physical/ verbal aggression and family violence, are more likely to develop more symptoms of internalizing disorders (Martinez-Torteya et al., 2009; Sternberg et al., 2006). In addition to interparental conflict, parent-child conflict has also been associated with increased internalizing outcomes. Negative parent-child relationships predict internalizing problems for youth across several studies with rural samples (Smokowski, Rose, et al., 2014; Smokowski & Bacallao, 2006; Wadsworth & Compas, 2002) and rural Latinx youth specifically (Smokowski, Rose, et al., 2014; Smokowski & Bacallao, 2006). Negative parent-child relationships are also associated with greater suicidal ideation, specifically for girls (Logan et al., 2011). Further, higher levels of intergenerational acculturative conflict have been associated with higher levels of depressive symptoms in adolescents of Mexican descent (Pina-Watson et al., 2019). Smokowski and colleagues (2014) found that youth who report negative relationships with their parents are more likely to endorse high levels of depressive symptoms. Thus, evidence suggests that conflictual family relationships have a direct impact on internalizing psychopathology in rural Latinx youth.

Family Conflict and Reduced Resilience

In addition to the negative effects of family conflict on internalizing distress, growing up in a family characterized by emotional distress, aggression, and disrupted parenting can be damaging to a youth's resilience. Resilience refers to the ability to positively adapt in the presence of adversity (Masten, 2001, 2007). Rutter (2012) proposes that environments that allow for autonomy and responsibility propagate resilience in youth, whereas parental negativity, or negatively expressed emotions, and family conflict, can often hinder this process. A biopsychosocial explanation of family conflict adds that aggressive or unresponsive parenting creates vulnerability for youth's psychosocial functioning and stress-response system and that opposite family environments-close and warm relationships in the family—promote individual resilience (Repetti et al., 2002). Ineffective family communication is a risk factor for poor resilience (Patterson, 2002a, 2002b) and is particularly concerning for Latinx families who navigate both typical conflict associated with adolescence as well as generational differences in cultural values (Lui, 2015). Thus, family conflict seems to be a stressor that compromises resilience and may be of particular salience for Latinx youth.

Increased Resilience and Reduced Internalizing Symptoms

Despite the presence of persistent stressors (e.g., family conflict) for many Latinx youth who live in impoverished rural areas, only a portion will develop internalizing disorders. Others in these contexts may emerge as resilient to mental health problems; that is, they are able to positively adapt in the presence of persistent stress (Masten, 2001, 2007). Higher levels of resilience in youth have been reliably linked to better mental health outcomes, including internalizing disorders. In community samples of high schoolaged youth, self-reported resilience was inversely associated with symptoms of depression (Goldstein et al., 2013), anxiety, and obsessive compulsion symptoms (Hjemdal et al., 2011). These results have been replicated in population-based studies, such as the Young-HUNT study, which surveyed 7,639 Norwegian adolescents and found that resilience characteristics were associated with lower symptom levels of both depression and anxiety (Skrove et al., 2013). Additionally, enhancing resilience has served as an important intervention target, and resilience-focused interventions have shown to be effective for reducing internalizing symptomatology among adolescents (Dray et al., 2017). The Penn Resiliency Program, a notable resilience-enhancing intervention, effectively reduced depressive symptoms in a diverse sample of adolescents, including youth from low-income Latinx communities (Cardemil et al., 2002). Though there are many documented individual-level factors that facilitate resilience, including optimism (Tusaie et al., 2007) and life satisfaction (Mak et al., 2011), environmental enhancers of resilience have received less attention (Perez et al., 2009; Tiet et al., 2010).

Extracurricular Activities as Resilience Enhancing Factors

Environmental protective factors are often measured at the school level in the context of adolescence (Perez et al., 2009) and can include extracurricular (EC) activities (Peck et al., 2008). ECs are organized activities in which youth typically interact with other individuals. Common ECs in high school include student council, sports, band/ music/choir, drama/theatre, and club membership. EC participation tends to be measured as a simple count of activities (Perez et al., 2009), or by the frequency of involvement in these activities (Peck et al., 2008; Tiet et al., 2010). The presence of ECs in youths' lives, as well as the number of EC activities youth engage in, increase their resilience in the face of adversity (Perez et al., 2009). For example, in the presence of family conflict, participation in EC activities longitudinally predicts increased resilience as indicated by greater adjustment and lower levels of antisocial behaviors in youth who live in low-resourced neighborhoods with high crime rates (Tiet et al., 2010).

There are several potential pathways by which ECs might promote resilience. For example, positive peer

relations and an interest in school are considered to be adaptive for youth (Grych et al., 2000; Hughes & Luke, 1998; Martinez-Torteya et al., 2009). ECs help students develop these relationships and interests as ECs in school settings often require youth to engage in teamwork and maintain good grades for participation. EC activities may also give children who experience familial difficulties (e.g., disruptions and violence) the opportunity to foster resilience by enhancing their conflict resolution skills (Downey, 2008). Further, EC activities provide students with resources, such as supportive friends, teachers, and adults, that have been shown to be predictors of academic resilience/success (Peck et al., 2008; Perez et al., 2009). Thus, continued investigation of EC programming seems to be a promising avenue to potentially enhance resilience among underserved youth using a system-level solution.

Given that external resources (e.g., participation in meaningful activities) can serve to mitigate the extent to which youth are impacted by a variety of stressors, it is pertinent that we investigate the potential capacity of system-level environmental contexts (e.g., afterschool programs, sports, and clubs) to enhance resilience, and ultimately reduce internalizing symptoms in adolescents. In the current study, we examine the extent to which resilience (an adaptive psychological process variable) mediates the relationship between family conflict (a persistent stressor) and internalizing symptoms in a sample of predominantly Latinx youth. We also investigate the moderating impact of EC activities—an environmental context variable—on the relationship between family conflict and resilience. First, we hypothesized that family conflict would be associated with increased internalizing symptoms by way of reduced resilience. Second, we hypothesized that youth with greater involvement in ECs would show higher levels of resilience in the presence of family conflict than those with lower involvement in ECs. Rural and Latinx youth are at a greater risk for developing internalizing disorders because they encounter stressors associated with their membership in an ethnic minority group and a scarcity of resources due to their geographic location. The examination of adaptive psychological processes and environmental contexts will contribute to identifying effective treatment targets for internalizing distress at the individual and community level and may help reduce mental health disparities among rural Latinx youth.

Methods

Participants

Data was collected from 792 adolescents as part of a larger study that assessed predictors of risk and resilience in a rural community. High school students from a public high school in a primarily rural region of Southern California were invited to participate in this study. The families that reside in this region are predominantly Latinx and have high rates of poverty (U.S. Census Bureau, 2017). Of the 792 adolescents who participated in the study, 191 participants did not fill out all three of the questionnaires and were excluded from the present study, leaving a final sample of 601 participants ($M_{ace} = 15.79$, SD = 1.21, 55% females). We ran chi-squared tests of independence to examine whether there was a relationship between inclusion status and gender, age, and ethnicity. Participants' inclusion status was related to sex (X_{2} (1, 789) = 4.46, p = .035) and to grade $(X^2 (3, 785) = 16.84, p = .001)$ such that boys and 11^{th} graders were more likely to have been excluded. The majority of youth self-identified as Latinx (86%; 66% reported that both parents were Latinx, and 20% that only one parent was Latinx) and the remaining 14% identified as Asian, Native American, African-American, White, or other. Adolescents were in 9th through 12th grade (27% 9th grade, 23% 10th grade, 23% 11th grade, 27% 12th grade) and the majority were born in the United States (89%). Regarding parental nativity, fathers were primarily born in either the United States (53%) or Mexico (32%). Of the remaining 15%, 2% were from diverse Latin American countries, and the remainder were from non-Latin American countries. Similarly, the majority of mothers were born in either the United States (54%) or Mexico (36%). Of the remaining 10%, 1% were from diverse Latin American countries, and the remainder were from non-Latin American countries. For additional participant characteristics, see Table 1.

Measures

Youth Self Report (YSR)

Internalizing symptoms were measured using the Youth Self Report (YSR; Achenbach, 1991) which measures sad, anxious, or depressed feelings in youth ages 11-18 years old. The YSR consists of 112 items and measures the following domains: anxious/depressed, withdrawn/depressed, somatic complaints, social problems, thought problems, attention problems, rule-breaking behavior, and aggressive behavior. It also assesses school and social functioning. A score ranging from zero to 62 for internalizing symptoms is possible on the YSR. The YSR has been used successfully with Latinx adolescents (Lacalle Sisteré et al., 2014) and has well-established psychometric properties that make it a reliable measurement of psychopathology in minority youth. In our sample, the entire scale showed excellent internal consistency ($\alpha = 0.95$).

Extracurricular Activities Measure. We utilized the Activities subscale in the YSR to calculate a measure of EC activity involvement, similar to several other studies with adolescent samples (Farineau & McWey, 2011; Willcutt et al., 2007). The Activities subscale was a free-response section of the YSR in which youth were asked to list the sports they most liked to take part in and organizations, clubs, teams, and/or groups they belong to. Youth were able to list any activities, both in and out of school, that they believed to be relevant for this section. For our sample, frequently listed activities were basketball, soccer, and Associated Student Body (ASB). In order to calculate a total score for EC involvement, we assigned a value of one to any activity listed in the Sports and Organizations subscales of the Activities section and combined the values to create a sum score of total ECs for each participant (Bohnert & Garber, 2007; Mahoney et al., 2002; Perez et al., 2009). Scores ranged from zero, for participants who did not list any organizational or sports involvement, to six, for participants who filled out all of the available spaces for sports and organizations.

The Family Relationship Index (FRI)

Family conflict was measured using a subscale of the FRI (Holahan & Moos, 1981). The FRI consists of 27 true/ false items that measure the quality of the family environment, specifically by measuring support from social relationships within the family. It is comprised of three subscales: Cohesion, Expressiveness, and Conflict. The Family Conflict subscale includes items such as "we fight a lot in our family" and "family members sometimes get so angry they throw things." A score from zero to nine is possible on the Family Conflict subscale of the FRI. The Family Conflict subscale has been established as a valid measure of conflict and has been used successfully in research with ethnically diverse youth (e.g., Brookman-Frazee et al., 2010; Garland et al., 2007).

Resilience Scale (RS)

The RS measured youths' degree of individual resilience, defined as a personal characteristic that promotes adaptation to stress (Wagnild & Young, 1993). The RS is comprised of 25 items that assess individual resilience by measuring Equanimity, Perseverance, Self-reliance, Meaningfulness, and Existential aloneness. The RS uses a 7-point Likert scale (1 = disagree, 7 = agree), to rate statements such as "I can get through difficult times because I have experienced difficulty before." A total score from 25 to 175 is possible on the RS, with higher scores indicating more resilience. This measure has been shown to be both valid (Wagnild & Young, 1993) and reliable (Killien & Jarrett, 1993). The RS has been used to assess resilience in adolescents (Hu & Gan, 2008; Hunter & Chandler, 1999; Wagnild, 2009) as well as ethnic minority adults (Ahern et al., 2006; Aroian & Norris, 2000; Humphreys, 2003; Smith et al., 2010). In our sample, the scale showed good internal consistency ($\alpha = 0.877$).

Procedure

Table 1

Demographic Data of Study Sample

Variable	%
Sex	
Males	45%
Females	55%
Age	
14	18.1%
15	24.5%
16	22.8%
17	29.5%
18	4.7%
19	0.3%
Child Ethnicity	
Latino, Hispanic, Mexican-American American	66.1%
White, Caucasian, European, not Hispanic Hispanic	6.7%
Asian, Asian-Pacific Islander	3%
American Indian, Native American	0.3%
Black or African-American	1%
Mixed	22.7%
Other	0.2%
Grade	
9	26.8%
10	22. 7%
11	23.2%
12	27.3%
Child Country of Birth	
United States	88.7%
Mexico	6.8%
Other	4.5%
Father Country of Birth	
United States	52.9%
Mexico	32.4%
Other	14.7%
Mother Country of Birth	
United States	53.9%

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Mexico	35.9%	
Other	10.2%	
Parent Marital Status		
Married	58.6%	
Divorced	20.8%	
Other	20.6%	
Mother Education		
High school graduate	24.7%	
Some College	24.2%	
College graduate	26.9%	
Other	24.2%	
Father Education		
High school graduate	30.6%	
Some College	20.4%	
College graduate	19.2%	
Other	29.8%	
Family Has Enough Money		
More money than I need	15.2%	
Just enough money	63.6%	
Not enough money	9.7%	
Other	11.5%	
Importance of School to Parents		
Very important	91.3%	
Somewhat important	8.4%	
Not very important	0.2%	
Not at all important	0.2%	
Religious Preference		
Catholicism	48.8%	
Protestantism	4.9%	
Buddhism	0.2%	
Hindu	0.3%	
Agnostic	1.5%	
Atheism	6.1%	
Other	24.1%	
I prefer not to specify	14.1%	

Students from a public high school were invited to participate in this study during one of their classes. They were provided with consent and assent forms in both English and Spanish to take home. Those who brought back signed forms were contacted by the research team to further explain the study and answer any questions. Students participating in the study were provided with class time (during their "free" reading period) to fill out various self-report questionnaires, all in English, although Spanish translations were also available. Hard copy versions of the surveys were provided for the youth to fill out during class. Upon completion of the questionnaires, all students were given a ten-dollar gift card as compensation for their time and participation.

Data Analysis Plan

A moderated mediation analysis was utilized to examine the association between family conflict and internalizing symptomatology, as well as the indirect effect of resilience in the full sample of rural youth who predominantly identified as Latinx. Further, we examined whether the indirect effect of resilience differed for individuals one standard deviation above and below the mean on extracurricular activities. The PROCESS macro in SPSS 25.0 was utilized to examine both mediation and moderation in a single model. Our results were generated using bootstrapping, a non-parametric resampling procedure which reduces confounds as well as suppression by variables included in the regression model (Preacher et al., 2007).

We used Model 7 to test moderated mediation; specifically, we examined the following relationships: (a) the effect of family conflict on internalizing symptoms, (b) the effect of family conflict on resilience, (c) the effect of resilience on internalizing symptoms, (d) the indirect effect of family conflict on internalizing symptoms through resilience (the proposed mediator), and (e) the interaction between extracurricular involvement and resilience (Figure 1). Analyses controlled for sex and age given that adolescents have been shown to differ in the level of psychopathology depending on the age at which they undergo puberty (Graber, 2013) and that girls have higher rates of internalizing disorders than boys (Behnke et al., 2011; Kessler et al., 1994; Smokowski, Evans, et al., 2014).

Analyses were conducted with the full sample, including a minority of participants who were not Latinx, a composition reflective of the demographics of the community in which the high school was situated. Huey and Polo (2008) and Pina et al. (2019) have stated that when samples consist of at least 75% ethnic-minority representation, the findings can be considered applicable to the ethnic minority group. Our sample was mixed but predominantly Latinx (86%); given that Latinx youth exceed the 75% threshold, we hypothesized that findings could be appropriately generalized to youth in rural Latinx communities. Post-hoc analyses were conducted to test whether the theoretically-driven decision to include all participants was statistically sound (i.e., whether results might change with the exclusion of non-Latinx youth, limiting our ability to generalize to rural Latinx).

Results

Descriptives and Relationship Between Study Variables

Raw scores on the YSR indicated that adolescents endorsed a low level of internalizing symptoms overall (M = 16.86, SD = 10.98). In regard to EC involvement, our sample scores ranged from zero to six EC activities. On average,

Figure 1

Conceptual Model of Moderated Mediation Examining Whether Involvement in Extracurricular Activities Moderates the Indirect Effect of Family Conflict on Internalizing Symptoms through Resilience



Table 2

Descriptive Statistics of All Study Variables

Measures	Mean	SD	Range of our Sample	Range of the Measure
YSR – Internalizing	16.86	10.98	1 to 55	0 to 62
YSR – Extracurricular	3.09	1.69	0 to 6	0 to 6
FRI – Family Conflict	3.84	1.96	1 to 9	0 to 9
RS - Resilience	133.61	18.70	47 to 173	25 to 175

youth were engaged in multiple activities (M = 3.09, SD = 1.69) such as basketball, soccer, and Associated Student Body (ASB). The FRI showed that family conflict was low on average (M = 3.84, SD = 1.96). Although participants varied widely on their resilience score on the RS, our sample was high in resilience on average (M = 133.61, SD = 18.70). For additional descriptive statistics of all study variables, see Table 2.

Moderated Mediation

Our model examined the mediating effect of an outside variable on the relationship between the independent and dependent variable, and the effect of the moderating variable on the outcome by way of the effect on the mediating variable.

The full model including the independent variable (family conflict), covariates (sex, age), mediator (resilience), and moderator (extracurricular activities) was significant, and accounted for 28.5% of the variance in rural adolescents' internalizing symptoms (F = 59.34, R² = .285, p < .001). The

Figure 2

Statistical Model of the Moderated Mediation Analysis

variance accounted for was a result of the negative relationship between family conflict and resilience (B = -1.79, SE = 0.38, p < .001), the negative relationship between resilience and internalizing problems (B = -0.16, SE = 0.02, p < .001), and the positive relationship between family conflict and internalizing symptoms (B = 1.61, SE = 0.20, p < .001). These results indicated that resilience partially mediated the relationship between family conflict and internalizing symptoms for this sample of predominantly rural Latinx adolescents.

In regard to moderated mediation, the interaction between family conflict and extracurricular activities did not have a significant effect on the level of resilience in youth (B = 0.33, SE = 0.22, p = .14). In other words, family conflict was negatively associated with resilience regardless of the amount of adolescents' EC activity involvement. Further, the number of EC activities youth were involved with was unrelated to resilience (B = 0.27, SE = 0.44, p = .54). These results indicate that the mediating effect of resilience in the relationship between family conflict and internalizing symptoms was not moderated by extracurricular activities.



Figure 3

Statistical Model of the Moderated Mediation Analysis for Subsample of Latinx-only Youth



Thus, there was no evidence of moderated mediation (Figure 2).

An identical moderated mediation model was run with a subsample of Latinx-only youth post hoc, to test whether any observed effects might have been altered by including a small percentage (14%) of non-Latinx youth. Our results revealed no significant differences in the magnitude or direction of any relationship from those reported in the full sample, confirming that the overall results remain unchanged. Figure 3 shows the statistical model of the post hoc analysis.

Discussion

In this study, we examined the association between family conflict and internalizing symptoms and the mediating role of personal resilience in a large sample of rural, predominantly Latinx youth. Further, we examined the moderating role of EC activities—a system level environmental resilience enhancing factor—on the relationship between family conflict and personal resilience. Our findings demonstrated that resilience partially mediated the relationship between the level of family conflict and internalizing symptoms. Thus, in this sample of underserved youth, family conflict led to greater internalizing symptoms by way of reduced resilience. Further, our moderation analysis showed that regardless of whether youth were involved in greater or fewer EC activities, family conflict was negatively associated with resilience.

Our finding that resilience mediates the relationship

between family conflict and internalizing symptoms adds to the literature by demonstrating that improvements in resilience may be an effective way of reducing symptoms of anxiety and depression in adolescents. Several treatment studies with ethno-racial minority youth have successfully targeted individual-level resilience in efforts to reduce internalizing psychopathology. In a study of 53 low-income Latinx youth, an intervention aimed at increasing individual resilience (i.e., enhancing social and cognitive skills instead of targeting a disorder) effectively reduced depressive symptoms (Cardemil et al., 2002) and anxiety (Gillham et al., 2006). A 6-month follow-up study found that the Penn Resiliency Program continued to be effective for Latinx youth (Cardemil et al., 2007). In addition, Poole and colleagues (2017) have shown greater resilience to be associated with less depressive symptoms in a sample of individuals who experienced adverse childhood experiences. Thus, increasing resilience could effectively improve mental health in youth, especially for ethnic minority youth who experience family conflict.

Our finding that family conflict was negatively associated with resilience adds to the existing literature linking family environment with child resilience characteristics. These results were consistent with prior work that highlights the importance of family relationships for the development of resilience and reduced psychopathology in youth (Rutter, 2012). For example, positive family environments have been shown to be associated with greater resilience (Repetti et al., 2002). Though this relationship has been well examined in non-Latinx and urban youth, the extension of this finding to predominantly rural Latinx adolescents has implications for treating underserved youth. Latinx adolescents encounter greater expectations to be helpful within their family units than non-Latinx, White youth (Fuligni et al., 1999; Smetana et al., 2006) and navigate differences in adherence to cultural values important to their parents (Fuligni, 2007). Thus, conceptualizations of family conflict should be expanded to include daily stressors associated with potential differences in adherence to cultural values in order to examine how culture and family influence resilience in Latinx youth.

The fact that family conflict was positively associated with internalizing symptoms and negatively associated with resilience in our sample of predominantly rural Latinx youth is unsurprising. Several previous studies have established that family conflict, defined as low warmth and high rejection, leads to greater internalizing symptoms in urban (O'Donnell et al., 2010), ethnic minority (especially Latina girls; Crean, 2008) and rural youth (Smokowski, Rose, et al., 2014; Smokowski & Bacallao, 2006). Our measure of family conflict included daily conflictual interactions, such as family environments that adolescents characterized as being highly argumentative or avoidant, and demonstrates that daily forms of conflict can still be damaging to a child's mental health. Further, resilience is unsurprisingly compromised because our sample of youth experience intersecting marginalization and have few or no treatment resources to bolster resilience. Thus, given that rural Latinx youth are at a high risk for developing internalizing disorders, it is imperative that we continue to explore resilience-enhancing factors in order to provide community-friendly and effective interventions for marginalized youth.

While our model supported resilience as a mediator for predominantly rural Latinx youth, we found no moderating effect of ECs on the association between family conflict and internalizing symptoms, conveying that ECs did not have an impact on the relationship between family conflict and resilience. There are several explanations for this null finding. It is possible that our measure of ECs did not accurately account for all the ECs that youth were involved in, as the YSR asked youth to "list the sports you most like to take part in" and to "list any organizations, clubs, teams, or groups you belong to." Thus, certain activities, such as being part of a mentorship program or holding a leadership position, may have been excluded. In general, the study may have underestimated these diverse types of activities. Alternatively, it is possible that it is not the count of extracurricular activities that youth partake in that matters, but instead the quality of the activities. Research suggests that resilience is fostered through the ability to build prosocial relationships with peers and adults (Masten, 2007) and the ability to problem solve (Downey, 2008). It may be that the prosocial connections that EC activities provide are the drivers of the positive outcomes observed in youth. Therefore, future studies may consider measuring EC activities by including questions that address how many friends the adolescent has within the EC they are involved in, their position in the EC activity, how supported they feel as a member of this EC activity, and whether they have access to supportive adults through this EC activity. Although several studies have been able to examine positive outcomes associated with EC activities (Bohnert & Garber, 2007; Farineau & McWey, 2011; Tiet et al., 2010), the field may benefit from a measure of ECs that examines what aspects of ECs are protective for at-risk youth.

In addition, although we did not measure resilience-enhancing factors that were culturally specific to Latinx youth, it seems that culturally inclusive, resilience-enhancing factors may be more salient within Latinx communities. Specifically, targeting resilience-enhancing cultural factors (e.g., biculturalism) may be especially helpful for increasing resilience in Latinx youth. For example, Smokowski and Bacallao (2011) suggest that a greater degree of biculturalism—the ability of a person to embrace their own culture and the culture of the country they live in-leads to greater resilience in Latinx youth. In addition, religious involvement, culturally rooted family values, and engagement in health-promoting interactions (e.g., connections with caring adults) are also factors that lead to resilience in Latinx youth (Lopez & Lechuga 2007; Padilla, 2006; Perez & Padilla, 2000). Given the importance of the family in Latinx culture (e.g., Leidy et al., 2010), it is not surprising that lower levels of interparental conflict in families predict greater resilience to emotional distress in youth (Chung et al., 2009). Although we did not measure these variables in our study, it seems that protective factors such as family cohesion, bicultural competence, and engagement in healthy activities all contribute to fostering resilience in Latinx youth.

Results of this study should be interpreted bearing in mind several limitations. First, our study design was cross-sectional, which limits our ability to determine temporal relationships between the variables in our model (Maxwell & Cole, 2007). Thus, we are unable to make causal predictions about the effects of family conflict on resilience processes and subsequent internalizing symptoms, demonstrating the need for longitudinal replication. Second, all data were self-reported, which introduces shared method variance and may introduce social desirability biases, which are especially salient for adolescents (Crockett et al., 1987). It is also important to consider that youth from rural communities have less access to EC activities (Yousefian et al., 2009). Thus, it may be that youth in our study face barriers to accessing EC activities, restricting the range of EC activities available, ultimately limiting the potency of EC activity involvement as a resilience-enhancing factor. Regarding the composition of our sample, though youth were predominately Latinx, 14% were of other ethnic backgrounds—representative of the broader community. Though we could have excluded non-Latinx participants, criterion used in meta-analytic work in clinical psychology supported our rationale that a sample comprised of over 75% of a particular ethnic group allows interpretations about that group (Huey & Polo, 2008; Pina et al., 2019). To further support this assertion, we re-ran our analyses confirming that the relationships reported held in a Latinx-only sample. Finally, these data are part of a larger study examining several sources of risk and resilience in youth. With that in mind, validated measures were selected to be brief to minimize participant burden. This approach allowed us to retain participants and gain a wider understanding of the psychosocial profiles of rural youth but limited the depth with which we were able to assess certain constructs.

Future studies should go beyond count measures of extracurriculars, and focus on the quality of participation. Further, when assessing family conflict, it will be useful to better understand the source and frequency of conflict to gain a better understanding of the specific types of family conflict that contribute to elevated levels of internalizing disorders among understudied groups. This effort will be supported by using measures that do not only rely on binary questions (e.g., True/False) and instead allow for responses that capture a range of family conflict and discourage extreme responses. Future research examining pathways of risk and resilience in ethnic minority rural youth would benefit from longitudinal designs to examine whether participating in more ECs over time effectively reduces internalizing or whether there is an age in adolescence when involvement in ECs could be the most effective for reducing internalizing distress in rural youth.

Yousefian and colleagues (2009) point to the crucial role of policy in promoting community-level resilience resources. Some examples include policies to provide opportunities for youth to engage in EC activities in schools and facilitate transportation for youth to and from EC activities. These structural modifications can work towards reducing disparities in access to EC activities for rural-dwelling youth and can provide an avenue that allows youth to utilize and engage in community-friendly intervention options. Further, Comas-Díaz (2015) highlights the positive mental health outcomes (e.g., psychological decolonization and personal transformation) associated with engaging in social justice work among people of color. Offering youth of color ways to engage in social justice as an EC activity may provide an opportunity for them to build resilience and advocate for their community. A resilience-enhancing, community-level solution may provide an avenue for treatments that overcome barriers, such as stigma and accessibility to treatment, to reduce internalizing symptoms in adolescents and provide more community-friendly intervention options.

Conclusion

In conclusion, the present study contributes to the growing body of literature on resilience by examining the relationship between family conflict, resilience, and internalizing symptoms while also examining the moderating role of ECs in a sample of predominantly Latinx youth who likely experience greater marginalization due to multiple intersecting minority identities (e.g., Latinx, rural, and immigrant status for some). Our study is among the few to examine extracurriculars in relation to psychological health. The results of our study support that targeting personal resilience among those who experience family conflict may be an important treatment target among Latinx youth with internalizing symptoms. Though the use of ECs to bolster resilience was not supported in our sample, research on system-level, resilience-enhancing factors should continue in order to ensure that resources already present in communities that may confer positive effects on mental health are accessed optimally.

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Molly Kennedy Irvin, BA Stanford University

Molly Kennedy Irvin graduated from Stanford University in 2020 with a bachelor's degree in Psychology with honors and a minor in English. While at Stanford, she spent much of her time working to improve mental health on campus, on both a personal level (peer counseling at the Bridge) and a community level (co-directing the Mental Health & Wellness Coalition). Molly believes that mental health development begins in early childhood, and she loved working with Dr. Michael Frank in the Language and Cognition Lab and Dr. Hyowon Gweon in the Social Learning Lab. Currently, Molly is a Clinical Research Coordinator at the Nathan Kline Institute for Psychiatric Research, working primarily with patients with schizophrenia and depression. Outside of research, Molly enjoys teaching comprehensive sex education and reading nineteenth-century British literature.



Was there a particular experience that sparked your research interests?

Before getting involved with developmental research, I did a lot of babysitting. While spending time with young children, I was often struck by their occasionally odd behavior. Why is this four-year-old repeating everything I say? Why would he give up when he's already done this puzzle successfully before? What is driving these seemingly erratic emotions? When I arrived at Stanford, I began looking for places to tease out these questions and further understand the children in my life, and in general. Thank you to the Language and Cognition Lab, the Social Learning Lab, and Bing Nursery School for providing those opportunities. And thank you to Carolina, Lucas, and Tiago for being my little muses!

Who has been the most influential person in your life?

My sister Elizabeth has influenced my life in countless ways. She supports me, counsels me, and always makes me laugh. Even though she's younger than me, I look up to her—her bravery and strength inspire me, and her vulnerability inspires me even more. I am incredibly grateful to go through life with her by my side—fighting our battles together, singing each other's praises, and jamming out to Disney Channel Original Movie soundtracks in the car. What is your greatest accomplishment?

In college, I co-taught Stanford's only comprehensive sex education course with my best friend. Despite administrator efforts to shut the course down, Mahima and I transferred the class to a new and more welcoming department, re-wrote the entire curriculum, recruited a dozen guest lecturers from various fields and specialties, and taught three semesters of the course (including one online). From reviewing contraceptive methods, to discussing media portrayals of abortion, to highlighting the importance of sexuality and pleasure education, I felt that we were able to give our students the information they need in their lives, as well as the ability to comfortably talk about it. This work inspired me to become more involved in sex and sexuality research in the future and to constantly commit to recognizing the importance of sexual health within mental health.

Where do you see yourself in 10 years?

In 10 years, I hope to have completed a PhD in Clinical Psychology. I hope to be actively involved in both research and clinical work, always maintaining a balance to ensure that my research is informed by my practice, and vice versa. To bring together all of my various interests, I intend to focus my work on healthy and unhealthy partnerships, sex and sexuality, and all different types of families.

"This one's great! That one's okay.": Investigating the role of selective vs. indiscriminate praise on children's learning behaviors

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Children rely heavily on feedback (e.g., praise) from parents and teachers to know how well they are doing and how to get better. The way that children understand, process, and respond to this feedback can reveal early cognitive and reasoning capabilities. How do children's inferences about the meaning and value of adults' praise influence their learning? While a significant amount of research has been conducted on different types of praise, this study aims to understand how the informativeness of different teachers' praise affects children's learning behaviors. Six- and seven-year-olds (pre-registered; N = 41) were introduced to an Overpraise Teacher (who praises all work) and a Selective Praise Teacher (who only praises higher quality work). While the amount of effort and time children spent practicing did not change depending on which teacher was going to evaluate their work, children did report that they would approach different teachers depending on their learning goals, and that they generally preferred the Selective Praise Teacher. This research provides initial evidence that children may prefer, value more highly, and selectively seek out informative (as opposed to indiscriminate) praise, and that they understand its potential impacts on their own learning.

Keywords: praise, cognitive development, social learning, parenting, teaching

One of the major tasks of early childhood is learning about one's abilities—what am I capable of doing, and how can I improve? Young children constantly engage in new activities, especially those that lack clear indicators of success, and they are often faced with uncertainty about the quality of their work or performance. They must rely on feedback from parents and teachers to figure out how well they are doing. For parents and teachers, then, a key task is figuring out how to give feedback that will best support their children's development. Is it better to tell children that everything they do is great to boost their confidence and self-esteem, or to be more selective and sparing with praise to encourage them to try hard to meet high standards?

These two tasks—children learning about their abilities, and adults sharing information about and evaluation of those abilities—intersect to produce a cognitively and behaviorally rich dynamic: parents and teachers modify their praise as they attempt to best support children's development, while children draw varied inferences about their own abilities from the praise they receive from these key adults. We know from existing research that praise matters for children's development (e.g., Mueller & Dweck, 1998), and that children can evaluate information depending on who it comes from (e.g., Gweon et al., 2014). The current research builds off these ideas to determine whether children react to praise differently when it comes from an informative teacher (who provides accurate feedback about quality of work) or from an indiscriminate teacher (who provides positive praise regardless of work quality), thus uncovering underlying developments in cognitive capacities and reasoning capabilities. More specifically, we investigated how children alter their learning behaviors depending on which teacher will evaluate their work. The learning behaviors assessed include how much effort children put into a task, their interpretation of learning goals, and their teacher preferences. Ultimately, what we sought to determine is how inferences about a teacher's informativeness impact children's learning experiences and shape their understanding of their own abilities.

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What We Know About Praise: Content and Context

Much developmental research has been conducted on children's various responses to feedback and praise from parents and teachers. While it is easy to assume that praise is universally positive (and earlier work has demonstrated its ability to reward certain behaviors, encourage future behaviors, and communicate expectations; Delin & Baumeister, 1994), research has also revealed its negative consequences. Praise can backfire by negatively impacting children's learning behaviors, decreasing challenge-seeking, and depressing intrinsic motivation (for a review, see Henderlong Corpus & Lepper, 2002). For example, Lepper et al. (1973) found that children who were praised (with a "good player award") for playing with new Magic Markers became less interested and motivated to engage with the markers afterwards, as compared to children who were not praised for their playing, who continued to enjoy the activity. This work suggests that providing praise may actually decrease children's intrinsic motivation and enjoyment, as children may learn that the only reason to complete a task is for praise. This research demonstrates that the impacts of praise on children's development vary widelypraising children can either help develop the learning behaviors we value, or undercut them.

Many studies have investigated whether children are sensitive to the content of praise that others give them, and whether this may explain prior inconsistencies in children's responses to praise. For example, one study found that children who were praised for their intelligence rather than their effort were more likely to hold fixed ability mindsets (the belief that skills like intelligence are innate, and cannot be changed with effort), rather than growth mindsets (the belief that skills are adaptable and can be increased with effort). Fixed ability mindsets are negatively correlated with achievement motivation, persistence in the face of failure, and task enjoyment (Mueller & Dweck, 1998). But praise content is likely not the only factor in determining the impacts of praise; the praise context may be relevant as well. One can imagine receiving the exact same praise from two people, but responding differently to each. For instance, imagine a teacher who always provides praise, irrespective of the quality of the work (an indiscriminate or "Overpraise Teacher"), versus a teacher who selectively provides praise, contingent on high quality of work (an informative or "Selective Praise Teacher"). Even if these two teachers provide the same praise content (e.g., "That's great!"), children may understand the meaning of the praise to be different, depending on their understanding of the teachers' informativeness.

One recent study attempted to answer these questions by showing 4- and 5-year-old children videos of a Selective Praise Teacher and an Overpraise Teacher responding to different tracings. After watching, participants made two tracings, the experimenter put them in opaque envelopes, and then left the room to "ask" each teacher what they thought. When she returned, the experimenter told the child that the Selective Praise Teacher said that one of the tracings was great, and the Overpraise Teacher said that the other tracing was great. When asked which of the two tracings they thought was better, children were more likely to choose the one that had been praised by the Selective Praise Teacher, even though they could not see the tracing themselves (Asaba et al., 2018). This research illustrates that children are indeed able to distinguish between different patterns of praise, likely drawing inferences about selectivity and trustworthiness, even when the praise content is the same.

Taken together, these studies find that children respond differently to praise that varies in content and/or context. What kinds of behaviors, then, are most affected? The current study analyzes how different patterns of praise change how children interact in learning environments by examining how hard they try on various tasks (i.e., the effort they put in), and who they approach for feedback (i.e., their teacher preferences).

What We Know About Learning Behaviors and How That Influences our Predictions

Persistence, or a willingness to put in effort, is one learning behavior that strongly predicts children's academic outcomes and achievements, and thus is a skill that many parents hope to foster in their children (Duckworth & Seligman, 2005; Eskreis-Winkler et al., 2014). They use praise as one way to encourage children to persist and to work hard. Recent work has suggested that children are sensitive to information in their social environment that might cause them to adjust their level of effort and willingness to persist on various tasks. For example, children persist longer after watching an adult put significant effort into a task (Leonard et al., 2017), persist less when an adult has taken over a task for them previously (Leonard et al., 2019), and try harder when they think their peers are better than them (Magid & Schulz, 2015). Children also use inferences about feedback and praise to adjust their effort or persistence. Mueller and Dweck (1998) demonstrated that children who received intelligence praise ("You must be smart"), as opposed to effort praise ("You must have worked hard") exhibited less task persistence, like asking to take problems home to keep working on them, after failing once. Praise content, then, can directly influence children's level of effort on subsequent tasks, for both better and worse. Additionally, children are sensitive to high standards and expectations set by praise and are driven to put in effort to meet them (Henderlong Corpus & Lepper, 2002; Magid & Schulz, 2015). Thus, in the current study, we predicted that praise context could influence children's effort, hypothesizing that children would put in more effort when they believed they would be evaluated by a Selective Praise

Teacher.

Finally, children's teacher preferences can also impact learning outcomes. A significant amount of research has been conducted on traits that lead children to endorse or approach certain adults; for example, Lane et al. (2013) demonstrated that children trust and prefer to learn from people who are nice, smart, and honest when they varied these traits in book characters. This may imply that, in a learning environment, children are carefully selecting which teachers to trust, seek out, and learn from, based on the personality traits they can discern-which can impact the way they develop socially and academically. For this task, various predictions could have been made based on prior literature. If children generally like people who are nice (Hamlin et al., 2007; Lane et al., 2013), they may prefer an Overpraise Teacher, who gives more praise and seems nicer. If children generally like people who are honest (Lane et al., 2013; Mascaro & Sperber, 2009), they may prefer a Selective Praise Teacher, who provides accurate commentary about the work presented to them. Thus, we were agnostic as to children's teacher preferences after being exposed to both patterns of praise. This study also suggests implications for changes in learning behaviors and outcomes based on children's decisions to approach and trust certain teachers over others.

Current Study

This study attempts to build on these areas of existing research to understand how patterns of praise, by allowing children to make inferences about informativeness, trustworthiness, and selectivity, impact children's learning behaviors of effort/persistence and teacher preferences. This can shed light on how children allocate effort and interact in learning environments—elements that can be adjusted to enhance learning and support development throughout the lifetime. To facilitate this, we showed children videos of two teachers, a Selective Praise Teacher who only praised higher quality work and an Overpraise Teacher who praised indiscriminately (adapted from Asaba et al., 2018), and analyzed resulting learning behaviors. We hypothesized that children would expend more effort and spend more time on work if they believed they would be evaluated by the Selective Praise Teacher as opposed to the Overpraise Teacher. Additionally, we hypothesized that children would choose to approach different teachers depending on their learning goals and praise preferences.

Methods

Participants

Forty-one six- and seven-year-olds (M_{Age} = 7.02, SD = 0.61, Range = 6.01 - 7.98) were recruited from the Palo

Alto Junior Museum and Zoo.¹ Six participants were excluded: three were not in the age range for the study, two did not speak English well enough to complete the task on their own, and one due to experimenter error (in reciting the script). Based on parent report, the sample included 18 girls, 12 boys, and 11 participants whose parents did not report their gender. 12 participants were identified by their parents as White, 11 as Asian, three as Hispanic/Latinx, two as mixed race, and the parents of 13 participants did not report their race. 22 participants attended public school, four attended private school, one attended a public charter school, was homeschooled, and the parents of 13 participants of 13 participants did not report their school type.

Stimuli

Warm-up pictures, pictures of Johnny and the teachers, videos, and memory check images were shown in a Keynote presentation on a 13-inch MacBook. The tracing template, practice tracings, and book were used during the Test Phase.

The evaluation videos consisted of one college-age actress ("Teacher Karen" or "Teacher Linda") sitting across the table from another actor ("Johnny," the student) who was voiced by a child but played by a college-age actor whose face was not shown. The actresses were race- and gender-matched to each other. In each of these videos, six cursive letter tracing templates sat on the table in front of the teacher, traced over with red ink. Three of the tracings were clearly good (the tracing is on or close to the lines), and the other three were clearly bad (random scribbles). Figure 1D depicts the final frames of one set of videos. In both videos, the voice of Johnny asks the teacher about the tracings. In one video, the Selective Praise Teacher looks at each tracing, says the good ones are great ("Let's look at this one...wow! What a great tracing!") and says the bad ones are okay ("Let's see...this one is okay."). In the other video, the Overpraise Teacher says each tracing is great. Stickers are placed above the praised tracings to help participants remember which tracings were praised, but not given to Johnny to serve as an external reward. Both teachers maintain a positive tone for both praise statements (i.e., "that's great!") and non-praise statements (i.e., "that's okay"). Teacher Karen wears a yellow shirt and gives yellow stickers, and Teacher Linda wears an orange shirt and

¹ It is important to note that the sudden outbreak of COVID-19 in the Spring of 2020 affected the data collection for this study. Based on the pre-registration criteria, the intended number of participants was 60, but collection had to be temporarily halted when museums closed, and therefore the analysis in this paper was conducted with an incomplete sample of 41 participants. It is expected that collection will resume when museums reopen, and data analysis can be repeated with a full sample.

Figure 1

Stimuli



Note. A) Two trials of warmup images, created on Keynote. B) Photographs of Johnny and the two teachers. C) The final tracing that participants completed, selected to be difficult for six- and seven-year-old children who have not yet learned cursive in school. It also shows the practice tracings, which were cut up and presented to the child in a randomized pile so they did not feel that they had to do the whole alphabet. D) Screenshots taken from the end of the evaluation videos, depicting each teacher with the tracings she did and did not praise.

gives orange stickers. Different sets of drawings were used in each video and the drawing set was counterbalanced half of the participants viewed Teacher Karen with Set 1 and Teacher Linda with Set 2, and the other half of participants viewed the reverse—to control for potential evaluations of one drawing set versus the other.

Procedure

This task had four phases: the Warm-up Phase, the Teacher Observation Phase, the Test Phase, and the Question Phase. In the Warm-up Phase, the participant sat down with the experimenter and was told that they would "meet some teachers and do some writing." They were first shown warmup images that "other children made," and demonstrated to the experimenter that they knew which ones were good. If they answered one warmup incorrectly, they were corrected; if they answered all warmups incorrectly, they were excluded from analyses.

In the Teacher Observation Phase, the participant was introduced to pictures of Johnny, Teacher Karen (Selective Praise Teacher), and Teacher Linda (Overpraise Teacher; actress counterbalanced to control for actress preference). They then learned that "Johnny really wants to know which of his tracings are good." They watched the Selective Praise Teacher evaluation video and answered an attention check question ("Which letters did Teacher Karen say were great?") while the last frame of the video was still visible (see Figure 1D). If they answered incorrectly, the video was replayed and the question was repeated; if they missed the repeat question, their data was excluded from analyses. The participant then watched the Overpraise Teacher evaluation video and answered the same attention check questions. Video order was also counterbalanced to control for changes in attention throughout the Teacher Observation Phase.

In the Test Phase, the key dependent measure was effort-how many practice letters the participant traced before completing a final tracing for one of the teachers. The participant was told that it was their turn to do some tracing and that they would be making a tracing for Teacher Karen (Linda), whose picture was shown. They learned that "Teacher Karen (Linda) is nearby, and she can tell you what she thinks of your tracing." They saw the tracing template they would be making for the teacher, which was selected to be difficult for six- and seven-year-old children who are relatively new to cursive and tracing. Participants were told they could do some practice tracings before they started the real one, and that practicing can help kids get better at tracing. They completed as many practice tracings as they wanted, only being moved on if they traced for more than four minutes. The experimenter announced that she was reading a book, and held the book in front of her face so the participant could see that she was not watching. Once they finished practicing, they began the final tracing, and were stopped for time reasons after completing the words "June" and "July."

In the Question Phase, the participant saw the images of the teachers (Figure 1D), was reminded of their names and was asked a series of questions. The first question was a memory check question ("Remember, you made this tracing for the teacher that is nearby. Can you remind me, which teacher is nearby?") to ensure that the participant was paying attention and knew which teacher was going to evaluate their work. They were then asked "Which teacher would help you get better at tracing?" to capture their beliefs about which type of praise is more important for improving their skills or abilities ("Improvement Goal"). To clarify their understanding of the role of the Overpraise Teacher, they were asked "Imagine that you just wanted a sticker. Who would you show your tracing to?" ("Sticker Goal"). Participants were then reminded that the Selective Praise Teacher gave stickers to "these three tracings" and were asked "Why do you think she did that?" in order to understand their spontaneous appraisal of selective praise ("Selective Praise Explanation"). They were asked the same question for the Overpraise Teacher ("Overpraise Explanation"). Finally, they were asked "Which teacher would you like to have in your classroom?" to get a general preference measure ("Teacher Preference").

After responding to these questions, the participant was thanked for playing the game and debriefed. The debrief included: "You know what? I just remembered that these teachers aren't actually here today, but I thought your tracing was great!" The whole process took about ten minutes.

Results

All participants in this task passed the warm-up questions (assessing which tracings were good and which were not), teacher name check questions (recalling and naming each teacher), video check questions (recalling which tracings each teacher praised), and manipulation check questions (recalling which teacher would evaluate their work). The primary dependent variables for this study relate to the practice tracings—how many tracings each participant made, and how long they spent tracing these letters. We hypothesized that children would complete, on average, more practice tracings, and spend more time on these tracings, when they knew they would be evaluated by the Selective Praise Teacher as opposed to the Overpraise Teacher. We ran separate linear

Table 1

Means and Confidence Intervals for Each Condition for Each Quantitative Dependent Variable

Variable	Selective Praise Condition		Overpraise Condition	
	95%			95%
	Mean	Confidence	Mean	Confidence
		Interval		Interval
Number of Practice Tracings	10.11	[7.36, 12.54]	11.85	[8.23, 15.62]
Total Time Spent Practicing (Seconds)	80.50	[61.73, 99.80]	96.94	[68.83, 124.23]
Time Spent on Each Practice Tracing (Seconds)	8.62	[7.37, 9.86]	8.85	[6.96, 11.25]
Time Spent on Final Tracing (Seconds)	19.12	[15.96, 22.88]	18.11	[15.23, 21.56]

regressions with condition (Selective Praise or Overpraise), age (continuous), and gender (boy or girl) as predictors for the number of practice tracings that children completed, the total time spent completing the practice tracings, and the average time spent on each practice tracing. We found that condition did not significantly predict the number of practice tracings completed (β = -1.074, t = -.439, p = .663), the total time spent practicing (β = -7.388, t = -.458, p = .650), or the average time spent on each practice tracing (β = .278, t = .221, p = .826). Table 1 includes the means and confidence intervals for each variable and each condition; Figure 2 depicts the number of practice tracings completed across each condition.

The secondary dependent variables related to the final tracing—how long each participant spent on the final tracing before they were moved on, and the quality of the final tracing they made. We hypothesized that children would spend more time on and create better quality tracings when they knew they would be evaluated by the Selective Praise Teacher vs. the Overpraise Teacher. We ran a linear regression with condition (Selective Praise or Overpraise), age (continuous), and gender (boy or girl) as predictors for the time spent on the final tracing and found that condition did not significantly predict the time spent on the final tracing (β = .834, t = .274, p = .785). Table 1 also includes the means and confidence intervals for this variable for each condition. The quality of the final tracings was to be assessed by adult ratings, but collection of this data was halted due to complications with COVID-19.

The final variables of interest included children's answers to the questions in the Question Phase. We hypothesized that children would selectively choose the Selective Praise Teacher for the Improvement Goal ("Who would help you get better at tracing?") and the Overpraise Teacher for the Sticker Goal ("Imagine that you just wanted a sticker. Who would you show your tracing to?"); we were agnostic as to the selection for the Teacher Preference ("Who would you like to have in your classroom?"). Some of these predictions were supported; Figure 3 depicts the answers to these questions. When asked which teacher they should approach if they want to get better at tracing, 92.68% of participants chose the Selective Praise Teacher (p < .001, Binomial Test). When asked which teacher they should approach if they just want a sticker, children were now more likely to choose the Overpraise Teacher (58.5%), compared to the Improvement Goal question (7.3%; p < .001, p)Fisher's Exact Test); note, however, that they did not significantly choose the Overpraise Teacher (p = .350, Binomial Test). When asked which teacher they would prefer to have in their classroom, 70.05% of participants chose the Selective Praise Teacher (p < .001, Binomial Test).

Discussion

Summary and Analysis of Findings

While all participants passed the memory check questions, demonstrating comprehension of the task, there was no significant difference in the number of practice tracings completed, time spent practicing, or time spent on the final tracing depending on which teacher participants were tracing for, signifying no effect of condition on effort. However, a significant majority of participants (92.68%) chose the Selective Praise Teacher to help them get better at tracing, and a significant majority (70.05%) chose the Selective Praise Teacher to have in their classroom, potentially signifying a preference for selective praise.

The results from the primary and secondary groups of dependent variables do not demonstrate a significant effect of condition on effort. There are several potential reasons why these results were observed. It is unlikely that children did not understand the task, as they passed all manipulation checks and gave informative responses in the Question Phase.

It is certainly possible that the teacher's praise pattern did not have any effect on children's effort on this task. However, it is also possible that tracing practice (in the form of individual letter tracings) may not have been the most relevant measure of effort. In addition, individual differences might have played an outsized role in this task. Some children may have been inclined to practice a lot, no matter who they would be evaluated by, while other children may have been confident enough in their chances of getting praised by both teachers that they did not feel the need to practice much for either teacher. Finally, the tracing task might have been too low-stakes, and thus children might not have felt the need to work harder to gain praise on work they did not care enough about. Further studies could be conducted to test some of these alternative possibilities.

While not the primary variables, the results from the Question Phase open up several layers of intriguing analysis. When asked which teacher would help them improve their tracing abilities, 93% of children chose the Selective Praise Teacher. This may serve as preliminary evidence that children's learning goals affect whose praise they seek out, based on what they know about teachers' selectivity and informativeness. This directly builds off Asaba et al. (2018), which demonstrated that children are more likely to trust the feedback from the Selective Praise Teacher. If children have the ability to recognize, based on demonstrated patterns of praise, which teachers will/want to help them learn, grow, and improve their abilities, they may be able to differentially seek out those teachers (and other adults) in learning environments; this could have the potential to greatly strengthen their learning processes and academic development.

When asked who they would approach if they just wanted a sticker, 59% of children chose the Overpraise Teacher (the predicted answer). There is a statistically significant difference in the amount of children who chose the Overpraise Teacher for this question in comparison with the Improvement Goal question, indicating that children did demonstrate that they would approach different teachers depending on the salient learning goal. However, we predicted that children would overwhelmingly choose the Overpraise Teacher here, which they did not. It is possible that children's understanding of learning goals was only sometimes affected by praise patterns, or that they were just more conflicted about this answer. An alternative interpretation is that, although children fully understood this question, many of them simply did not want a sticker from the Overpraise Teacher—even if they were sure they would get it. They may have developed, even in this relatively short task, a strong enough bias against this teacher that they no longer desired her praise at all—a conclusion that would seem at odds with the body of work demonstrating children's preferences for people who seem nice (Hamlin et al., 2007; Lane et al., 2013). This could suggest an even stronger basis for the argument (made in the next paragraph) that children prefer selective and informative praise, which thus merits further investigation.

When asked which teacher they would prefer to have in their classroom, 70% of children chose the Selective Praise Teacher. While these data may not be completely conclusive, as participants' answers could have been affected by their answers to the previous questions (the questions in the Question Phase were presented in a fixed order and not counterbalanced), tentative inferences may still be drawn. If children prefer to have the Selective Praise Teacher in their classroom, it may indicate that they prefer this teacher generally, that they prefer selective praise generally, and/ or that they want to continue to have the opportunity to seek out this more informative feedback. While parents may believe that children seek praise indiscriminately, the results of this study, in conjunction with previous literature, potentially serves as an indicator that this may not be the case-that children have a nuanced understanding of praise, and may prefer and seek out more selective, informative, and meaningful praise, even if it means getting less praise overall. Taken together, the findings of this study provide initial evidence that praise patterns that allow children to make inferences about informativeness, selectivity, and trustworthiness may affect certain learning behaviors, such as learning goals and teacher preferences.

Potential Limitations

The most significant limitation in this study was the broad view of praise that was taken. In this research (as in much praise literature), it is necessary to stereotype praisers—here, with two teachers who use praise in precise patterns—even though people are rarely entirely Selective Praisers or Overpraisers. This allows us to draw broad conclusions about patterns of praise that may exist in the real world. Relatedly, other work has demonstrated the importance of specific and descriptive praise messages, tailored to individual children or to groups. In various studies, Brophy (1981), Chalk and Bizo (2004), and McClannahan and Krantz (2004) found that descriptive praise (e.g., "good job mixing the colors in this painting"), in comparison to general praise (e.g., "good job") positively impacts children's development. Cohen et al. (1999) found that, when receiving critical feedback, racial minority students responded more positively when the feedback also included indications from the teacher that they believed that the student could achieve high standards. This research suggests that the best encouragement for children's learning and development is likely praise that is specific, individualized, and contextual. While this study was not able to achieve these detailed conditions, future work may be able to research praise patterns while incorporating more descriptive or tailored praise messages.

Additionally, both teachers in this paradigm exclusively delivered performance praise, and given the demonstrated significance of praise content, it is not clear that children's responses to these teachers would generalize to selective or overpraisers using different praise content. Future work could compare responses to teachers who give praise that varies in both pattern (selective vs. indiscriminate) and content (ability vs. effort) to understand the overlap and distinctions here.

Implications for Parents and Teachers

Despite this limitation, this study has salient real-world implications and applications for caretakers of children. While parents and teachers do not occupy the same role in children's lives, both groups typically teach, facilitate growth and learning, and provide praise. While this paradigm focused on teachers, it gathered children's responses to patterns of praise that would theoretically be consistent regardless of context, as cognitive ability is not specific to interactions with certain types of people.

Both parents and teachers generally want to support the development of certain learning behaviors in their children and students (such as hard work, persistence, and seeking out growth opportunities) but are rarely given empirical guidance on how to do so. They typically rely on conventional wisdom about parenting, which shifts with changing cultural norms and reinterpretations of historical conceptions of what it means to be a good parent. One style that has surged in recent years is the "praise junkie" (described in Suissa, 2013), who praises so frequently and unconditionally that their children develop an insatiable need for constant affirmation. The data analyzed in this paper contradict this approach—as even six- and seven-year-old children understand that a selective praiser, while perhaps conventionally understood to be less nice or less supportive, will help them improve their skills more than an overpraiser. Furthermore, children differentially prefer to have the Selective Praise Teacher in their classrooms, possibly suggesting that children would rather receive selective praise in the long run. Although we certainly cannot conclude that selective praise is the best kind of praise to be employed in all situations, there is a general indication that praising everything enthusiastically, equally, and always in an effort to make children feel good may not actually support their learning and growth, and that children themselves might know that.

Future Study

The data presented in this research offer many different directions for further study. One avenue would be to investigate the impact of individual differences in the Teacher Preference data. One particular individual difference that may be modulating these results is self-esteem. Brummelman et al. (2014), examined children's self-esteem in relation to inflated praise, such as referring to a child's work as an "incredibly beautiful drawing," rather than just a "good" or even "beautiful drawing" (but all within the category of performance praise). Results indicated that children with high and low self-esteem were affected very differently when they received the same praise content: children with high self-esteem were more likely to seek further challenges, while children with low self-esteem curbed challenge seeking behaviors, potentially feeling overwhelmed by the high standard and unsure if they could meet it again. This study demonstrated that children with low self-esteem are less likely to seek out challenging tasks after receiving certain types of praise.

This may imply that children in this task were also impacted differently based on their self-esteem. As we have seen in this data, 93% of children report that the Selective Praise Teacher would help them get better at tracing, but only 70% of children chose to have the Selective Praise Teacher in their classroom. While this data is limited, it may be examined as potential evidence that even though most children understand the Selective Praise Teacher to be more informative and more helpful in improvement, many still choose to spend more time with the Overpraise Teacher potentially prioritizing a necessary self-esteem boost over an opportunity to learn. If this study could be replicated with additional self-esteem evaluation, we would be able to better understand the role of this potentially modulating factor and see if low self-esteem prevents children from seeking out known learning opportunities, either for fear of failure or not believing themselves to be up to the task.

Conclusion

While the data from this study indicate that children's effort may not be significantly affected by teacher praise patterns, there is initial evidence that other relevant learning behaviors, such as learning goals and teacher preferences, may be impacted. These results, in combination with existing praise literature, indicate that children have a deeply nuanced understanding of the feedback and praise they receive from key adults in their lives.

In contrast with the current cultural emphasis on the importance of protecting children's feelings from potential perceived harm by offering only positive feedback, it appears that children prefer and seek out adults who offer more informative praise. Therefore, adults might ultimately better support children by resisting the urge to praise indiscriminately and offer them more selective praise. By acting on this information, parents and teachers might be able to better achieve their original goal of supporting children's development. Therefore, caregivers need accurate and accessible empirical guidance about how their praise, goals, and patterns impact children's development, learning, and growth-to ultimately understand how sensitive children are to the nuances embedded in feedback. This information, together with clear guidance on how to best deploy these powerful tools, can help caregivers and teachers intentionally, confidently, and most importantly, successfully help children grow up with confidence, a solid growth mindset, and an appetite for honest and substantive feedback on their performance that helps them improve and develop.

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Sophia graduated from Tilburg University in 2020 with a Bachelor of Science in psychology, majored in cognitive neuropsychology and minored in medical psychology. At the moment, she is in her final months of her Master of Science by Research in differential psychology at the University of Edinburgh. She hopes to obtain her PhD in neuropsychology and study medicine to combine both research fields. In her free time, she enjoys sports, music, and likes to travel.

Was there a particular experience that sparked your research interests?

I started studying psychology without a definitive goal in mind. During my first course on brain and behaviour, I noticed that I was more interested in this side of psychology than any other and started focusing on the interplay of psychological phenomena and the underlying neural mechanisms. There was not one specific experience but rather one specific lecturer that made me want to research this topic in-depth, namely Dr. Ruth Mark. She was my lecturer in another course at the time and agreed to supervise my thesis. I went through some of my interests with her and we agreed that the stroke population was the best to choose from since there are so many factors that can be looked at when investigating stroke patients. Together with my first literature review on TBI, those pieces of work shaped my research interests and paved the way for my research master.

Who has been the most influential person in your life? Throughout my entire life, I would say that my father has always been the most influential person in my life. He is by far the smartest man I know and worked for everything he ever owned himself. He taught me how to persist during stressful periods, how to always have a plan B, and most importantly, to never do anything to less than 100%. During my academic career however, the most influential person is my boyfriend, who was (and still is) my best friend at the time because he always challenged me to think about things differently and critically. Overall, he made me question what I really wanted and supported my every step of the way. Both know how to listen to me while asking the right questions and have made me feel like I can come to them for advice.



What is your greatest accomplishment?

This is a tough one. I tend to focus on what's ahead rather than on what's in the past, so thinking about this, I would have to say that my greatest accomplishment is my relationship with my friends. They are infinitely important to me and having had them by side tells me that I must have made an effort through all of the tough times to keep the friendship alive. Secondly, I have made friends for life during my undergraduate studies and I consider each and every one a personal accomplishment since they have enriched my life in ways that I could not have imagined otherwise. Surely, objective accomplishments, such as graduating from high school and university, being accepted into a world-renowned university and pursuing my research degree are big accomplishments as well, but none of it would have happened without the support of my friends.

Where do you see yourself in 10 years?

In this moment, I am considering my options as how to proceed in my career. I don't feel prepared to go into the world on my own as there are so many more things and skills that I would like to learn. My academic interests will keep me at university for a good 10 years, which hopefully includes a PhD and MD, but beyond that I also have other goals. I would like to get a dog and live and nice home, maybe in a beautiful city, together with my favourite human. In ten years, I see myself having travelled a bit more and having experienced a fraction of the world's beauties. I see myself as equally knowledge-thirsty as I am now but having found out slightly more about how humans function, how decision making is constructed and how we can treat those suffering diseases that damage those areas.

The Relationship of Subjective Cognitive Complaints with Depression and Anxiety Symptoms in Left- and Right-Sided Stroke Patients

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Subjective evaluations of cognitive performance among stroke patients are gaining more prominence within the research literature. However, there is still relatively little research on subjective cognitive complaints (SCC) in this population. This research paper aimed to investigate the relationship of mood problems (i.e., anxiety and depression) and SCC in left- and right-sided stroke patients. 148 patients were assessed at three months after a stroke on the measurements CLCE-24, HADS-A, and HADS-D. The results showed that while right-sided stroke patients scored higher on the HADS-A, left-sided stroke patients did not score higher on the HADS-D. There was no significant difference between scores on the CLCE between the patient groups. High anxiety levels correlated with higher SCCw levels in right-sided patients, but depression levels did not correlate with SCCw in left-sided patients. These results suggest that there is a relationship between mood problems and right-sided stroke patients not found in left-sided patients. Researchers and clinicians should emphasize the interplay of subjective estimates and mood problems in left-and right-sided stroke patients as they can mask how patients rate their complaints. The actual subjective performance of the patients could be negatively influenced by the symptoms associated with mood problems.

Keywords: stroke, hemisphere, mood problems, subjective cognitive complaints

Stroke is the second leading cause of death worldwide, and there are over half a million new stroke cases annually (Kolb & Whishaw, 2014). It is defined as "the sudden appearance of neurological symptoms as a result of interrupted blood flow" (Kolb & Whishaw, 2015). The conseguences are heterogeneous and affect cognition, mood, and activities in daily life (ADL). Common pre-stroke symptoms are confusion, trouble walking, and sudden headaches (Scimemi, 2018). Depending on the type of stroke, symptoms may be present or absent in the patient, making it harder to distinguish between strokes (Alberts et al., 1990). Similarly, post-stroke symptoms vary extensively with regard to severity, type of stroke, and lesion location. They typically include concentration problems, difficulties in language expression, memory impairments, and mood disorders such as depression and anxiety (Pappadis et al., 2019).

Asymmetry in Emotional Processing

In healthy individuals, the left side of the prefrontal cortex (PFC) processes pleasant emotional stimuli, whereas the right side of the PFC processes unpleasant emotional stimuli (Coan & Allen, 2004). This suggests an asymmetry in the way emotional information is represented throughout the frontal lobe. However, in depressed patients there is a shift towards less activity in the left region of the PFC and higher activity in the right region of the PFC. According to the hemispheric encoding/retrieval asymmetry (HERA) model, memory encoding and retrieval for nonverbal stimuli are related to asymmetrical processing in the left and right PFC (Habib et al., 2003). Several studies have found a link between emotional stimulus processing and asymmetrical brain functioning (Ahern & Schwartz, 1985; Grimshaw & Carmel, 2014; Thibodeau et al., 2006). Herrington et al. (2010) examined emotional differences in depression with respect to asymmetric brain functioning in fMRI data. The results showed that both trait depression and emotional stimulus processing are different for the PFC in the right and left hemispheres. This suggests that the emotional effects of having suffered a stroke could be related to lesion location (Aström, 1996; Berg et al., 2001; Pappadis et al., 2018; Robert et al., 1983). For instance, in left-hemispheric strokes, individuals experience a lateralization of mood disorders causing positive emotions to not be registered at a healthy level, and the right hemisphere takes over. Throughout the literature, a significant number of stroke patients that suffer from poststroke depression also meet the criteria for an anxiety disorder, most commonly Generalized Anxiety Disorder (GAD; Aström, 1996; Chemerinski & Robinson, 2000). This comorbidity is also reliably associated with left-hemispheric strokes. However, when anxious stroke patients without a co-diagnosis of depression are evaluated, results show there is a higher prevalence of the stroke occurring in the right hemisphere. Currently, there is no consensus on a rationalization of this symptomatology as it is not explainable by the lateralization theory (Aström, 1996; Berg et al., 2001; Pappadis et al., 2018; Robert et al., 1983). Overall, patients with a rightsided stroke report more signs of anxiety, such as excessive worrying, whereas left-sided patients report more depressive symptoms, such as feeling inadequate after having had a stroke and throughout recovery (Aström, 1996; Berg et al., 2001; Pappadis et al., 2018).

Stroke and Anxiety

The link between stroke and anxiety has been investigated in multiple studies. According to Broomfield et al. (2014), one-quarter of post-stroke patients develop anxiety symptoms within six months. The most reported symptoms are excessive and constant worrying, as well as the fear of not being able to return to one's everyday routine (Pappadis et al., 2018). Showing symptoms of anxiety can lead to less involvement in the rehabilitation process and thus slow down the recovery time (Shin et al., 2016). Moreover, anxious patients are often managed by disruptive thoughts which makes stroke recovery increasingly difficult. This is reflected in the success rate of treatment, signaling that an anxiety disorder significantly lowers positive functional outcomes of stroke treatment (Aström, 1998; Leppävuori et al., 2003; Shin et al., 2016). Aström (1996) investigated levels of GAD for three years after a stroke and found that symptoms occurred more often in right-hemispheric stroke patients. As Chemerinski & Robinson (2000) found, patients with GAD alone were significantly associated with right-sided lesions, whereas comorbidity of GAD with depression was significantly associated with left-hemispheric lesions. This was revealed three months after the stroke and persisted throughout the three years of follow-ups. After one year, 31% of the patients had recovered from GAD. Two years later, only 38% of the patients had recovered from GAD. This suggests a slowed recovery rate of anxiety symptoms in right-hemispheric stroke patients. To date, there is no conclusive explanation to account for the symptoms shown after anxiety occurrence in rightsided stroke patients. This might be due to the fact that anxiety disorders also occur in comorbidity with depression, as mentioned above, suggesting a more complicated system that underlies the clinical diagnosis (Chemerinski & Robinson, 2000).

Stroke and Depression

In a study conducted by Broomfield et al. (2018),

among 4079 stroke patients, one-third showed depressive symptoms. Elderly patients seem to be especially prone to the development of post-stroke depression (Berg et al., 2001). Left-hemispheric stroke patients more frequently develop depressive symptoms like frustration and inadequacy or experience negative affect in their daily lives (Pappadis et al., 2018). This is associated with a slower rehabilitation process because patients with depressive symptoms tend to use rehabilitation services less efficiently (Gillen et al., 2001) and show poor involvement in the recovery process (Shin et al., 2016). Cully et al. (2005) have demonstrated that depressive symptoms are negatively related to functional abilities such as communication (Kidd et al., 1993). Creating a distinction between the psychological symptomatology of left- versus right-sided stroke patients can help provide a more nuanced screening tool. Subsequently, it allows for tailored planning of rehabilitation programs. It enables clinicians and therapists to take a closer look at the mood disorders that might develop post-stroke (Schöttke & Giabbiconi, 2015).

Subjective Cognitive Complaints (SCC)

Measuring subjective cognitive complaints (SCC) is important to assess the perceived severity of complaints and how much they affect the patient's life. SCC are complaints patients can experience post-stroke and are an increasingly important factor in the overall decline of cognition (Hohman et al., 2011). Examples of SCC range from physical sensations, such as headaches and distorted vision, to mental symptoms, such as the inability to concentrate and recall memorized information. Complaints are measured from a subjective perspective, which gives insight into the patient's picture of their abilities after a stroke. SCC are self-reported and typically assessed using questionnaires or via single open-ended questions. These types of instruments can accurately reproduce the individual remarks of the patients' experiences after having had a stroke, whereas objective measurements are less likely to capture the subjective state of the patients. In addition to this, SCC can be divided into two domains. SCCc reflect the content, i.e., what problems people report (e.g., difficulties with memory and concentration). SCCw reflect the degree of worry, i.e., whether people say that the SCC hinder them in their daily lives or not (Van Rijsbergen et al., 2013). SCCc provides an understanding of which complaints patients have to deal with. Since this is heterogenous, there are many ways in which a stroke can impair subjective cognitive functions (e.g., reduced concentration, difficulties with expressing oneself, etc.). SCCw on the other hand, are concerned with whether this complaint, small or big, is affecting activities in daily life and ultimately hindering recovery and life after the stroke (Wendel et al., 2008). This distinction is made because, like most individual differences, patients have various thresholds as to what they perceive as inhibiting. By outlining this difference, it is not only measured which complaints patients display but also the extent to which these complaints need to be rated on a functional level (Van Rijsbergen et al., 2013).

Stroke and SCC

SCC are common after a stroke and affect a large portion of the patient's daily life. This is because strokes manifest in multiple different ways in the brain and often have long-term cognitive, physical, and emotional effects (Nijsse et al., 2017). Thirty-two percent of post-stroke patients report feeling more anxious, while 44.8% claim to have an overall more depressed mood over the course of nine months after hospital admission (Hochstenbach et al., 2005). These changes in mood may influence the way people cope after their strokes (Sisson, 1998). In order to adequately assess the psychological and subjective complaints, it is important to include self-reports that focus on the patient's estimation of their predicament. Moreover, the inclusion of SCC measures could help identify the way patients experience their complaints at the beginning and throughout the rehabilitation process (van Rijsbergen et al., 2019). Because of the heterogeneity of this medical condition, it is important to uncover all of the symptoms that are crucial for recovery, including those that are not measurable by biophysical assessments.

However, a study by Marino et al. (2009) that investigated neurological patients suggests that looking at subjective reports alone only reveals part of the complaints because mood also has an effect on a patient's SCC. Thus, emotional complaints, such as a depressed mood, can influence the patient's evaluation of cognitive complaints, such as concentration problems (Marino et al., 2009). Mood disorders, such as anxiety and depression, are strongly related to the frequency of subjective complaints that patients report. Within the stroke population, there is relatively little research on all domains of SCC, while there is more on subjective memory complaints (SMC; Van Rijsbergen et al., 2013). SMC measures the perceived memory problems that patients experience while SCC deals with the broader domain of perceived cognitive problems, making them more inclusive than just SMC. In fact, few studies combine SCC with mood disorders that are associated with stroke injuries, specifically anxiety and depression (Dufouil et al., 2005). Neither anxiety nor depression symptoms in relation to SCC are adequately represented throughout the literature. Likewise, most research focuses on objective cognitive performance and mood problems among stroke patients (Nakling et al., 2017; Quinn et al., 2018; Weinstein et al., 2014).

The Present Study

This study investigates the relationship between subjective cognitive complaints (SCC) and mood problems in left- and right-sided stroke patients. Based on the effects of lateralization in stroke patients, the first hypothesis states that right-sided patients will have higher anxiety levels compared to left-sided patients. The second hypothesis states that left-sided patients will have higher depression levels compared to right-sided patients. Both depression and anxiety symptoms were measured using the Hospital Anxiety and Depression Scale (HADS; Stern, 2014). The third hypothesis predicts that right-sided patients will have more SCC than left-sided patients. The fourth hypothesis states that the levels of SCCw in rightsided patients can be partly explained by levels of anxiety, which means that higher anxiety scores correlate with higher levels of SCCw. The fifth hypothesis states that levels of SCCw in left-sided patients can partly be explained by levels of depression. This means that higher depression scores correlate with higher levels of SCCw. SCC was measured using the checklist for cognitive and emotional consequences following stroke (CLCE-24; Heuqten et al., 2007).

Method

Participants

This research uses the dataset of the COMPlaints After Stroke (COMPAS) longitudinal study that was previously conducted by Van Rijsbergen et al. (2013). 211 stroke patients were tested at three months post-stroke. 104 patients had a stroke in the left hemisphere while 80 had a stroke in the right hemisphere. The remaining patients were undifferentiated in the side of stroke meaning that no data on the side of the stroke was available (see Table 1 for demographic data of the final sample). The participants were recruited from three stroke units in the Netherlands, namely the St. Elisabeth and TweeSteden Hospitals in Tilburg and the Máxima Medical Centre in Veldhoven. Inclusion criteria consisted of a clinical diagnosis of a first or recurrent ischaemic or hemorrhagic stroke. The minimum age was set at 18 years with no upper age limit. The age range in this sample was 30 to 95 years. Exclusion criteria were pre-existing health problems interfering with cognitive functioning, including cognitive decline (as defined by a score >3.6 on the short version of the Informant Questionnaire on Cognitive Decline in the Elderly; IQCODE; Jorm & Jacomb, 1989), a recent history of severe psychopathology (e.g., suicide attempts, alcohol or drug misuse, diagnosed personality or mood disorders, etc.), severe physical comorbidity (e.g., malignant diseases, progressive neurological conditions, etc.), and severe communication difficulties (e.g., insufficient understanding of the Dutch language, severe aphasia, blindness or deafness, etc.).

Measures

Anxiety and Depression

Anxiety and depression scores were measured with the HADS (Stern, 2014). This test was chosen because of its wide clinical applicability and practical usage. It has also been studied in a wide variety of contexts, including clinical as well as non-clinical populations, such as employees (Bocéréan & Dupret, 2014; Herrero et al., 2003). Moreover, it is considered to be unaffected by coexisting medical conditions, which is useful in this patient population (Snaith, 1987). It consists of 14 questions, seven of which measure anxiety (HADS-A) and seven which measure depression (HADS-D). Each item has four answer options, such as "not at all," "a little but it doesn't worry me," "yes, but not too badly," and "very definitely and quite badly." The items are intermixed, but the scoring from 0 to 4 is calculated separately for anxiety and depression, respectively. Example items include "I have lost interest in my appearance," "I feel as if I am slowed down," and "I still enjoy the things I used to enjoy." The minimum score for both the depression and anxiety scale is 0, with 21 being the maximum score. The patients are considered normal with a score below 7, borderline with a score between 8-10, and abnormal if they have a score of 11 and higher. Both scales demonstrate good reliability (HADS-A: Chronbach's 0.83; HADS-D: Chronbach's = 0.82; Bjelland et al., 2002). The Chronbach's alpha coefficient for the HADS-A in the current sample was 0.79 and 0.81 for the HADS-D. A study by Herrmann (1996) showed good validity for the HADS (r > 0.90).

Subjective Cognitive Complaints (SCC)

SCCtotal was assessed with the Checklist for Cognitive and Emotional consequences following stroke (CLCE-24; Heuqten, et al., 2007). This is a structured clinical interview that measures subjective complaints among stroke patients. It was chosen because of its effectiveness to provide a holistic view of the participant. With regard to the concept of SCC, clinical interviews provide a more comprehensive understanding of the complaints the participants display, as would be the case with questionnaires. There are 13 items that examine cognitive complaints and nine items that address emotional and behavioral complaints. Each item is scored as 0 (Not Present), 1 (Doubtful), 2 (Present, but not affecting daily life) or 3 (Present and negatively affecting daily life). Example questions include: "Since the stroke, have you had problems with doing two things at once?" and "Since the stroke, have you had problems with taking initiative?" In this sample, SCCw was obtained by dichotomizing the scores on the CLCE into 0 (not hindering daily life) and 1 (hindering daily life). Internal consistency proved to be reliable (Chronbach's = 0.81;Heugten et al., 2007). For this study, only items one through 13 were considered since they measured SCC. The remaining nine items that measure emotional complaints

were excluded from the analyses, in order to limit redundancy, as they correlated with the HADS-A (r = 0.5, n = 112) and HADS-D (r = 0.5, n = 112). The Chronbach's alpha coefficient of the total scores of the CLCE in this sample was 0.7.

Procedure

Eligible patients were informed about the study by their treating physician and also received oral and written information about the study at the time of the clinical phase. Demographic and clinical features were reported and informed consent was obtained. The CLCE-24 and the HADS were administered by a neuropsychologist at the respective hospital the participant had done the study in. When this was not possible, it took place at the participant's home or residence (e.g., rehabilitation center). The tests were administered by a neuropsychologist regardless of the location. There was no compensation given to the participants for taking part in this study.

Statistical Analysis

The hypotheses that anxiety levels are higher for rightsided stroke patients and depression levels are higher for left-sided stroke patients were tested. Two one-sided, independent samples t-tests were conducted to compare the groups of the independent variable (side of stroke; L or R) with the dependent variables (anxiety and depression). A third and fourth one-sided, independent samples t-test was conducted to compare the levels of SCCtotal and SCCw in both groups. In these t-tests, the independent variable was the side of stroke and the dependent variables were SCCtotal and SCCw, respectively. The scores for the t-test were not standardized because the variables were measured with the same instrument and were only compared among left-and right-sided patient groups within this sample. To test whether anxiety and depression partly explain SCCw in the right-and left-sided stroke patients, two simple linear regression analyses were conducted. A priori power was calculated using the program G*Power 3.1 (Faul et al., 2007). To detect a medium effect between right- and leftsided patients (d = 0.5) with a power of at least 0.8 (=0.05) and an allocation ratio (N2/N1) of 0.77, 104 participants were required in total. All statistical analyses were performed with SPSS version 24. The original dataset included 211 stroke patients. An outlier was defined as three or more standard deviations above or below the mean. Participants were not included in the study if there was missing data on either the side of the stroke (including the undifferentiated cases), the HADS, or the CLCE-24. In this sample, missing data is ascribed to participants forgetting to enter information on the questionnaires and/or incomplete medical files (e.g., information about the site of lesion). The analyses excluded nine outliers and 54 cases of missing data as defined above, leaving a final sample size of N = 148, with 86 right-sided and 62 left-sided stroke patients. An alpha level of 0.05 was used throughout all analyses.

Results

Demographic Variables

The two groups of patients were compared on their demographic variables, gender, age, and IQ by means of t-tests. The age range across the entire sample was 30 to 95 years. The mean age was similar in both right-sided stroke patients (M = 63.6, SD = 11.8) and left-sided stroke patients (M = 65.6, SD = 13.2). More males had a right-sided stroke (60.4%) than a left-sided stroke (39.6%). The same holds for females, with 53.8% having suffered a right-sided stroke and 46.2% a left-sided stroke. IQ was the same across groups (right-sided patients: M = 95.9, SD = 13.3; left-sided patients: M = 65.6, SD = 13.2). Almost all strokes were classified as an infarct; only a small portion was identified as bleeding (Infarcts: 139; Bleedings: 9). There were no significant differences between left- and right-sided patients on these variables (see Table 1).

HADS-A and HADS-D

An independent samples t-test was used to examine whether scores on the HADS-A are higher for right-sided stroke patients, and we found that right-sided stroke patients demonstrated higher levels of anxiety (t = 2.205, df = 146, p = 0.0115). Another t-test was used to examine whether left-sided patients have higher scores on the HADS-D. Contrary to the expectations and literature, leftsided stroke patients did not show significantly higher levels of depression (t = 0.627, df = 146, p = 0.734). It is worth noting that while the results did not reach significance, the trend of the scores on the HADS-D is in line with the prediction.

SCCtotal and SCCw

For ease of interpretation, standardized z-scores were computed for the dependent variable SCCw and the independent variables anxiety and depression. The levels of SCCtotal between left- and right-sided stroke patients were compared using an independent sample t-test. Results showed that rightsided patients did not score higher on SCCtotal than left-sided patients (t = 0.368, df = 146, p = 0.713). These findings suggest that anxious patients do not display higher levels of SCC. A simple linear regression was carried out to further test this, and the results show that the model is significant (F(1,84) = 28.67, p < 0.001). Scores on the HADS-A in right-sided patients explained 25.4% of the total variance in CLCEw (= 0.254). Pearson's correlation between HADS-A and CLCEw equals to 0.504 (r = 0.504, n = 86, p < 0.001). When testing the other group,

Table 1

Descriptive Data of Final Sample

		Right-sided	Left-sided	p-value
		stroke	stroke	
Sex				
	Male	60.4% (N=58)	39.6% (N=38)	.443
	Female	53.8% (N=28)	46.2% (N=24)	
IQ		M = 95.9	M =96.0	.968
		(SD = 13.3)	(SD = 11.2)	
Age		M = 63.6	M = 65.6	.342
		(SD = 11.8)	(SD = 13.2)	
History				
	First stroke	59.1% (N=78)	40.9% (N=54)	
	>1 stroke	50% (N=8)	50% (N=8)	
Stroke type				
	Bleeding	55.6% (N=5)	44.4% (N=4)	
	Infarct	58.3% (N=81)	41.7% (N=58)	

namely that depression levels partly explain SCCw in left-sided patients, the results were not statistically significant. When testing to see how much variance in depression levels accounts for SCCw in left-sided stroke patients; the model was also not significant (F(1,60) = 2.74, p = .103). This suggests that depression levels in left-sided patients did not influence SCCw levels. Scores on the HADS-D in left-sided patients explained 4.4% of the total variance in CLCEw (= 0.044). Pearson's correlation between HADS-D and CLCEw was equal to 0.209 (r = 0.209, n = 62, p = .052). This trend, however insignificant, suggests that SCCw in left-sided patients could potentially be explained by levels of depression.

Discussion

The aim of this research paper was to examine the relationship between SCC and mood problems in left-and right-sided stroke patients. From the results section, key features about the relationship between the above-mentioned variables emerge. Importantly, the results of this sample are partly in line with the current literature on stroke patients, SCC, mood disorders, and respective lateralization. Right-sided stroke patients scored higher on the HADS-A than left-sided patients meaning that they demonstrate higher levels of anxiety. Moreover, one-quarter of the worrying component of SCC could be explained by anxiety symptoms in right-sided patients. However, left-sided patients did not have a higher mean score on the HADS-D. Right-sided patients, in fact, scored lower than left-sided patients on SCC, and depression did not explain SCCw in left-sided patients. There were no significant differences between the side of stroke and demographic variables, namely gender, age, and IQ, which means that the patient groups were homogenous with regard to these variables.

Right-sided patients scored significantly higher than leftsided patients on the HADS-A. The results indicate that in this sample, right-sided patients showed a higher prevalence of anxiety. This implies that there is an association between the location of the stroke, namely in the right hemisphere, and anxiety symptoms, which is in line with previous research that suggests there is a link between right-hemispheric strokes and the occurrence of anxiety problems (Aström, 1996; Kim, 2017). The results also showed that scores on SCCw can be explained by scores of anxiety in right-sided patients which show that patients with high anxiety levels also tend to worry more about their SCC. This could be due to the fact that excessive worrying is a major factor in the diagnosis of an anxiety disorder and SCCw specifically addresses the degree to which patients rate their complaints as worrisome and/or hindering in daily life. Thus, patients who worry excessively will also report more SCC. In turn, they will worry more about those complaints than patients who do not report anxiety symptoms. These reports have an important impact on how the patients might present themselves during a clinical interview. Patients who exhibit more anxiety symptoms might have an overlapping report on SCC. The domains' mood problems and SCC differ, but they do influence each other in a way that might alter the image of the patients' subjective state. Although self-reported, it could be that because patients are preoccupied with their mood that they distort how they evaluate their cognitive problems. The results of this research paper showed there is good reason to look at anxiety in relation to SCCw. As reflected in the study by Marino et al. (2009), the presence of a mood disorder can explain reports of SCCw as well. This is a vital element for the way clinicians and researchers should look at patients' subjective reports, as they might be associated with symptoms of anxiety or depression. Future research should focus on including the occurrence of mood problems as a covariate when estimating SCC. However, not only are professionals benefitting from this type of knowledge, but relatives and significant others might also be able to judge the mindset of their loved ones more accurately. In fact, caretakers could better understand the patients' experience and adapt their behavior and expectations accordingly. This is especially relevant because there is evidence that the relationship between caretaker and patient can influence the patient's recovery time and perceived ability to cope with the circumstances (Kim, 2017; Secrest, 2000).

It was predicted that right-sided stroke patients score higher on SCC than left-sided patients. This hypothesis was rejected because the results were not in line with that prediction. One possible explanation for that could be that lesion location is not as crucial in whether the patients report Table 2

Descriptive Statistics of Depression, Anxiety, CLCEc, and CCLEw in Stroke Patients

	Right-sided stroke	Left-sided stroke	p-value
CLCEc	M = 8.2	M = 8.5	p=.713
Range: 0-39	(SD = 6.8)	(SD = 5.9)	
CLCEw	M = 1.9	M = 2.0	p=.798
Range:0-39	(SD=2.1)	(SD = 2.0)	
HADS-A	M = 4.9	M = 3.6	p=.0115*
Range:0-21	(SD = 3.7)	(SD = 2.9)	
HADS-D	M = 5.1	M = 4.7	p=.734
Range:0-21	(SD = 4.0)	(SD = 3.6)	

Note: * = p < 0.05

Note: * = p < 0.05

SCC altogether. What is more important is the type of mood problems that accompany SCC, as in this case anxiety relates more to the worrying component as to the total score of SCC. The assumption that left-sided stroke patients will have higher scores of depression symptoms was not in line with the results. Hecht (2010) showed that the left hemisphere, which is responsible for pleasurable experiences, is hypoactive in depressed patients. In contrast, the right hemisphere that is involved in processing negative emotions is hyperactive. The explanation of why the results were not supportive of the prediction could be because in patients with depression there might be an imbalance of right and left hemispheric activity (Hecht, 2010). It could be more conclusive to look at the interplay of both hemispheres with regard to stroke patients who develop depression (Alves et al., 2008; Hecht, 2010). Moreover, there is no link between left-sided patients that show signs of depression and their levels of SCCw. Seeing as the left-sided stroke patients had low scores of depression overall (see Table 2), it could be that this sample was not representative of the population, as the literature shows a consistent link between depression and left-hemispheric lesions (Pappadis et al., 2019).

The strength of this study is that the two patient groups matched in their demographic variables. There is sufficient evidence to believe that neither IQ nor gender or age had an influence on the variables that were tested. The sample size in this paper was larger than the required sample size, according to the power analysis. This is of benefit because a higher power is more likely to reject a false negative (Type 2 error) and in turn, the probability of finding a statistically significant result increases. Additionally, the COMPAS study (Van Rijsbergen et al., 2013) was the first to divide SCC into the two components of SCCc and SCCw using widely accredited measures, including the CLCE. This serves as a strength for the current research paper. Unfortunately, the original paper by Van Rijsbergen et al. (2013) excluded the most severe stroke patients, including aphasia patients, which limits the generalizability of their study and this research paper. Additionally, only participants from the Dutch population were included. There are cross-cultural differences in how mood disorders manifest (i.e., differences in symptoms and desire to disclose them; Kleinman, 1977). Working with a Western sample might be unsuitable for explaining SCC in relation to anxiety and depression levels in other cultural settings. This is particularly relevant when investigating collectivistic cultures, such as Japan, because they are associated with somatization symptoms of mental disorders, which can result in different symptom reports or little disclosure altogether (Ng, 1997).

Moreover, the measures used for SCC and anxiety/depression are purely subjective reports. As mentioned above, there are advantages to using them, such as practical utility, inexpensiveness, and a more precise assessment of the patient's subjective experience. On the other hand, they are also subject to confounds related to the participants' ability or willingness to fill them out (Shi et al., 2010). Since both measures are answered by the same patients, there is a risk that they will tap into the same constructs, regardless of their statistical validity. Therefore, future research should include objective measurements to correct these confounds. This might include presenting emotional stimuli to the patients in order to obtain a reaction on an objective basis. Using both subjective and objective measures could help identify the patients' perspectives but, at the same time, control for their potential lack of insight or situational distractions. The biggest limitation is the broad differentiation between left- and right-sided stroke patients. The pathways and neural networks that can be impaired after a stroke within one hemisphere, and between the two, are much more complicated than the mere distinction of hemispheres. These factors and functional pathways are obscured in this sample but should be more specifically addressed in future research. Since strokes frequently encompass both hemispheres, further research on how inter-hemispheric pathways contribute to these findings is needed (Kessler et al., 1999; Kim, 2017).

There are significant differences with regard to lesion location and the manifestation of a mood disorder (Mitchell et al., 2017). This research only found an association with anxiety in the right hemisphere; nonetheless, it is still important to pay attention to the side of the stroke occurring in both right- and left-sided stroke patients. A more detailed distinction of the cortical and subcortical areas in each hemisphere and their relation with mood is needed to further investigate the influence it has on the SCC of stroke patients.

The assessment of mood problems in relation to SCCw should be highlighted and monitored throughout the recovery

process of stroke patients. In addition to this, the occurrence of anxiety or depression symptoms might be related to the hemisphere the stroke has occurred in. As a consequence of that, left- and right-sided stroke patients might behave differently given the distinct psychological problems of each hemisphere, and in turn, might not be able to use their rehabilitation phase efficiently. This is important because researchers should not underestimate this relation and be aware of the interplay of subjective estimates and mood complaints in leftand right-sided stroke patients when assessing them in clinical practice and for research purposes. Subsequently, clinicians should use this knowledge to monitor the number of mood complaints throughout the recovery process of the patients. Clinically, it is important to understand the lateralization of psychological symptomatology in order to form individualized treatment plans as well as screening tools that detect mood problems before they hinder the recovery altogether. This research paper has shown that the relation between SCC, stroke location, and mood problems is relevant for both clinical practice and research because it incorporates subjective ratings and potential anatomical influences to establish a more integrative picture of the patient's experience.

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Genevieve Yong Mei Qi is a final year Concurrent Degree Programme student at the National University of Singapore in the Psychology program, currently pursuing both a Bachelor's and Master's Degree. Genevieve is interested in the field of educational psychology and positive psychology and is working on her Master's thesis, under the guidance of Dr. Lee Li Neng. Her thesis explores the relationship between motivational climates initiated by social groups and fear of failure in undergraduate students. Her research interests lie in the psychology of pedagogy and andragogy, and how motivational psychology can be incorporated into educational practices, such that learners can get the most out of their learning experiences. In addition, with a great interest in connecting with others and serving the community, Genevieve also enjoys volunteering regularly, helping out in character- and leadership-building programs for girls in the community.



Was there a particular experience that sparked your research interests?

My passions for education and the youth have been cultivated through many different experiences in my growing up years, and refined through my undergraduate experience in the Psychology programme in the National University of Singapore. Dr. Lee Li Neng, my thesis supervisor, helped to spark a deep compassion for the youth and his mentorship helped me to expand my comfort zones as a researcher. An educational psychology module with Dr. Mariam Aljunied further nourished my passion and interests in education by providing an excellent overview issues and topics within education psychology. Both Dr. Li Neng and Dr. Mariam went the extra mile to encourage students who wanted to learn more about the field, drawing on their own experiences to provide sage advice to a young, and slightly clueless, budding researcher. My experiences with Dr. Silja Voolma were also crucial in cultivating my interests as a psychology researcher.

Who has been the most influential person in your life? As someone who has the great fortune of meeting many inspiring mentors and teachers, their effort and input into helping me grow as a person has helped to push me to go further and do things that I did not think myself capable of. However, if I were to pinpoint the most influential person in my life, it would have to be my mother. She taught me the importance of maintaining a good work ethic, to know the importance of pushing myself toward excellence, while supporting me every step of the way. Her sacrifices and efforts into nurturing me and raising me is something I greatly appreciate.

What is your greatest accomplishment?

I hope that my greatest accomplishments are yet to come! But in all seriousness, I am thankful for the chance to be able to impact the lives of the communities I have had the opportunity to work with, be it through academic research projects or volunteering projects in the community.

Where do you see yourself in 10 years?

I hope that Genevieve 10 years into the future will be in a career that is meaningful, leading a fulfilled life with cherished friends and family by my side!

The Current Landscape of Internet Gaming Disorder: Literature Review of Definition, Determinants, Interventions and Policies in Internet Gaming Disorder

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As online gaming increases in popularity globally, a proportion of gamers face challenges in regulating their gaming behaviors, leading to the presentation of addiction-like symptoms (Wei et al., 2017), which are associated with negative health outcomes (Lam, 2014), difficulty in sustaining attention (Bailey et al., 2010), worsened academic performance (Wright, 2011, Brunborg et al., 2014, Ferguson et al., 2011) and decreased social skills (Zamani et al., 2010). To categorise and consolidate the phenomenon of problematic gaming behaviour, Internet Gaming Disorder (IGD) was introduced into the field of clinical study. This paper aims to provide a systematic review of the symptoms of IGD, controversies surrounding empirical research of IGD symptoms, as well as assessment tools and prevalence rates. Determinants of IGD behaviour are also presented, which aid in understanding the multitude of risk factors that interplay to produce these behaviours. In view of this, this paper examines several previously studied intervention methods of IGD to compare the advantages and disadvantages of different intervention methods, thus providing a more holistic view about their effectiveness and limitations. Through the analysis of both international and Singaporean policy strategies, the merits of using a combination of interventions and policies are also elucidated.

Keywords: Internet Gaming Disorder (IGD)

While it has been established that online gaming can confer social, psychological and cognitive benefits to players (Granic et al., 2014), for some individuals, online gaming can also have negative consequences. Excessive gaming can lead to an inability to regulate gaming behaviors, resulting in the presentation of addiction-like symptoms (Wei et al., 2017). These problematic behaviors surrounding online gaming are associated with negative health outcomes (Lam, 2014), difficulty in sustaining attention (Bailey et al., 2010), worsened academic performance (Brunborg et al., 2014; Ferguson et al., 2011; Wright, 2011) as well as a decline in social skills (Zamani et al., 2010). In light of these symptoms, Internet gaming disorder (IGD) has been introduced as a way to categorise and consolidate the phenomenon of problematic gaming behavior and its associated symptoms (Wei et al., 2017).

Researchers have identified several distinct symptoms as key features of the disorder, such as increased tolerance toward Internet gaming that may lead to the need to increase time spent gaming to satisfy urges, unsuccessful attempts to reduce or quit gaming, and withdrawal symptoms when gaming is taken away (American Psychiatric Association, 2013). Grant et al. (2010) provides a broad definition of withdrawal symptoms as a "dysphoric state" which stems from abstaining from a particular addictive behaviour, which can include feelings of irritation or anxiety following the cessation of gaming behaviour (Tsai & Lin, 2003). However, contention exists over several issues to define criteria for IGD in the Diagnosis and Statistical Manual for Mental Disorders (DSM). This paper highlights two controversies: The first controversy pertains to the inclusion of withdrawal symptoms as part of the phenomenon of IGD. The other discusses the overlap between pathological addiction symptomatology and non-pathological engagement, in which the degree of negative disruption to real-world activities is used to distinguish between engagement, a non-problematic psychological state, and addiction symptoms. These issues contribute to a muddled understanding of IGD symptomatology, which impacts the development of diagnostic tools and measurement of prevalence rates. Further discussion along these two lines of discourse can help to increase focus and attention on the prevalence of IGD so that measures for pathological gaming can be made with higher specificity and higher accuracy.

Despite the absence of a standard diagnostic measurement tool, studies have attempted to measure the national prevalence rates of pathological gaming across different countries. In a report of national
and colleagues (2015), prevalence rates in European countries under 5% in Norway and Hungary, and under 2% in Germany, Netherlands, Spain, and Romania. Singapore, on the other hand, has prevalence rates of 9% according to Gentile and colleagues (2011), who conducted a two-year longitudinal study on pathological gaming among adolescents, using the Pathological Video Game Use scale. This scale is an 11-item scale that measures video game use, according to the domains of salience, euphoria, tolerance, conflict, relapse, and reinstatement (Gentile et al., 2009). Consistent with the trend in international prevalence rates of pathological gaming, Singaporeans rank as one of the highest in Asia in terms of time spent online gaming (Limelight Network, 2018). With this in mind, this paper reviews therapeutic interventions and policies addressing this rising problem across different countries. In addition, this paper reviews how these policies have been adapted in a Singaporean context to combat the mounting issue of IGD.

DSM Criteria for Internet Gaming Disorder

In the Diagnosis and Statistical Manual for Mental Disorders (DSM-5), IGD is categorised under Section III 'Emerging Measures and Models' which lists disorders that require further research before being considered as formal disorders (American Psychiatric Association, 2013). The DSM-5 (2013) suggests that the clinical diagnosis of IGD consists of persistent and recurrent use of the Internet to engage in gaming, resulting in clinically significant impairment or distress over a time period of at least 12 months. Clinically significant impairment or distress can be conceptualized as the meeting of five or more of the symptoms of IGD, which include: (1) preoccupation with games; (2) withdrawal symptoms when gaming is taken away; (3) the need to increase gaming time to satisfy urges (tolerance); (4) unsuccessful attempts to reduce or quit gaming; (5) loss of interest in other previously enjoyed activities; (6) continued excessive use of Internet games despite knowledge of psychosocial problems, (7) deceiving others regarding the amount of Internet gaming; (8) use of Internet games to escape or relieve negative moods; and (9) jeopardizing or losing a significant relationship, job, or education or career opportunity because of participation in Internet games (American Psychiatric Association, 2013). While no quantitative standards are given to guantify excessive usage, it can be defined as impaired control and increasing priority of gaming over interests and daily activities to the point of significant impairment in functioning (King & Delfabbro, 2020). However, there are controversies related to using these criteria (Griffiths et. al., 2014, Kaptsis et. al., 2016, Wei et. al., 2017), largely surrounding concerns of ambiguous terminology, in which a consistent definition of withdrawal symptoms has not yet been well-established, and confounding non-pathological experiences of psychological engagement with pathological symptoms of addiction

in forming the foundation of IGD criteria.

Particularly regarding the criteria of withdrawal, Kaptsis and colleagues (2016) have raised concerns over the lack of qualitative studies providing clinical descriptions of symptoms after the cessation of gaming. Withdrawal symptoms have been better established as key physiological components of substance use disorders (Baynard et al., 2004; Koob, Maldonado & Stinus, 1992). Withdrawal symptoms can manifest as feelings of anxiety, worry, and irritation, or a strong desire to re-engage in gaming following the cessation of gaming (Beranuy et al., 2013; Griffiths, 2010; Tsai & Lin, 2003). In their systematic review of qualitative studies, Kaptsis and colleagues (2016) found that withdrawal symptoms for gamers have been documented in less than 50 individuals out of a total of 118 participants. In contrast, a majority of survey-based studies of Internet-related disorders described withdrawal symptoms as part of the experience of IGD, suggesting that the inclusion of withdrawal symptoms have been processed on assumption instead of empirical observation (Kaptsis et al., 2016). On the other hand, other alternative models of gaming problems which exclude withdrawal symptomatology have yet to be adequately considered. According to Kaptsis et al. (2016), an alternative model of problem gaming can include multiple subtypes of problem gaming, which are conceptually different from IGD but similar to the clinical classifications for alcohol use (American Psychiatric Association, 2013). For instance, "binge" gaming could be considered as a subtype of problem gaming, which involves episodes of excessive continued usage of online gaming, but individuals do not appear to experience preoccupation with online gaming or the typical withdrawal symptoms (Kaptsis et al., 2016). Hence, with consideration of other forms of symptomatology, a clearer abstraction of adverse craving for gaming through further empirical studies of clinical samples may be needed to better describe such symptoms.

Another issue based on the DSM criteria for IGD is the confounding of non-pathological high engagement and pathological addiction. Charlton and Danforth (2007) differentiated between addiction and engagement. They characterised addiction as symptoms of conflict, withdrawal, relapse and reinstatement, and behavioural salience. On the other hand, engagement is a non-pathological psychological state that includes cognitive salience (preoccupation), tolerance, and euphoria. Ferguson et al. (2010) suggests the use of "interference" to distinguish between high engagement (non-pathological) and addiction. According to Ferguson et al. (2010; 2011), interference refers to negative disruption of real-world activities and is a crucial characteristic when defining problematic behaviours (Beard & Wolf, 2001; Ferguson et al., 2011). This suggests that despite a high degree of gaming and preoccupation with gaming, individuals who do not experience negative disruption (interference) due to Internet gaming behaviours can be considered as being in a state of high engagement, rather than pathological addiction (Charlton & Danforth, 2007). Several studies argue that interference factors are the only defining criteria that differentiate between non-problematic, high engagement, computer-related behaviour and pathological computer-related addictions (Charlton & Danforth, 2007; Ferguson et al., 2011).

Hence, using the current polythetic diagnostic system in the DSM, an overestimation of the prevalence of IGD and false-positives may occur if the majority of symptoms displayed by an individual meets criteria for engagement factors, rather than interference factors. This concern is echoed in Charlton and Danforth (2007) and Ferguson et al's (2010) recommendations that criterion describing engagement may be inappropriate during research or diagnosis of IGD. They also call for increased research focus into the concept of interference so that more specific and accurate measures for pathological gaming behaviour can be established (Ferguson et al, 2010).

Assessment tools and Prevalence Rates

Given these debates on the defining attributes of IGD among different researchers, a key consideration presented by the Substance Use Disorder Work Group is the lack of standard diagnostic criteria and measurement to assess gaming addiction across the myriad of studies conducted to investigate IGD (Griffiths et. al., 2014; King & Delfabbro, 2014). In a review of screening instruments meant for the assessment of problematic, pathological and addictive gaming, 18 different screening instruments had been developed. All instrument measures were significantly different from each other in their conceptualization and diagnostics of IGD (King et al., 2013), showing evidence for a lack of consensus and agreement on the presentation of IGD. These discordant measurements are largely due to the aforementioned debates on specific criteria, as well as the adaptation of existing criteria of other disorders (primarily pathological gambling or substance dependence) on the assumption of conceptual similarity (King & Delfabbro, 2014). Studies found prevalence rates ranging from 0.1% to over 50% (Petry et al., 2015) and these discrepancies can be accounted for by the different measurement tools used, which were developed from slightly different conceptualisations of IGD (King et al., 2013). For example, from a summary of psychometric instruments for pathological gaming by King et al. (2013), out of 18 instruments used, only one instrument, Problem Video Game Playing scale, tested for all nine criteria in the DSM criteria for IGD. On the other hand, tools like the Online Game Addiction Scale for Adolescents in Taiwan (OAST) and the Online Game Addiction Index (OGAI) test for four and three criteria out of nine, respectively (King et al., 2013).

This lack of general consensus is a problem in the gaming addiction field as the differing screening instruments has led to high variability of prevalence rates (Kaptsis

et. al., 2016) and an inability to make direct comparisons across various demographics and cultures (Griffiths et. al., 2014). Thus, a unified approach using the same assessment measures is needed as a strong empirical basis for the inclusion of IGD in the DSM-5 (Griffiths et. al., 2014).

One way forward to streamline the variety of screening instruments into a common assessment measure is to first carry out further psychometric research to assess the clinical validity of the criteria used in screening tools. In doing so, irrelevant diagnostic items, which may include withdrawal symptoms and engagement factors, can be sieved out. Following which, researchers can then leverage on the refined DSM criteria and make adjustments accordingly, bringing the current screening tools nearer to consistency, with higher sensitivity and specificity.

Determinants of Behaviour

Determinants of IGD and risk factors can be organised into (1) external factors, which include accessibility of online games, (2) contextual elements of online games, and (3) personal characteristics of online gamers.

External Factors

External factors include elements such as the variety and accessibility of online games, convenience, and Internet speed. These factors increase the likelihood of individuals engaging in online gaming behaviour and the likelihood of intensive and extended periods of playing (Bothun et al., 2012).

Contextual Elements of Online Games

What makes Internet gaming so addictive? The hallmark of behavioural addiction disorders is the development of an addictive state without substance intake. In the case of IGD, this sensitization process that alters impulsive behaviours to compulsive behaviours develops from several key features of online gaming. These features include the rewarding and immersive characteristics of online gaming (Wei et al., 2017), and the ability of online gaming to address a spectrum of needs, which include relationship building, escapism, need for achievement and mastery (Xu et al., 2012). These benefits increase motivation to extend playing time, which sensitizes the brain reward system, thus potentially leading to pathological symptoms in vulnerable populations (Wei et al., 2017).

The gaming industry also leverages these benefits to attain habitual and repetitive play so that their games can be played by a large number of gamers for longer periods of time, maximizing revenue from each game (Kiraly et al., 2017). Developers exploit several psychological mechanisms to increase a player's investment in the long term (Kiraly et al., 2017). In particular, developers use operant conditioning through variable-ratio reinforcement schedules, achieved through methods such as giving out valuable in-game rewards at unpredictable and irregular intervals to increase the amount of time a player invests into the game (Charlton & Danforth, 2007).

Game service providers provide a plethora of different online game genres, including Massively Multiplayer Online Role Playing Games (MMORPG), First Person Shooter Games, Multiplayer Online Battle Arena (MOBA) games and other hybrid forms which combine different elements of each game type. In particular, MMORPG and MOBA games are especially popular among adolescents (van Rooij et al., 2011) and are played by nearly 50% of online gamers (Nagygyörgy et al., 2013). To understand the attractive nature of these games, Wei et al. (2017) identified two characteristic features of these online games: provision of freedom in a virtual space and online anonymity. Together, these game elements satisfy specific psychological needs of online players and lead to an increase in desire to play and feelings of euphoria, contributing to the highly addictive aspect of these games (Wei et al., 2017).

Firstly, with respect to the provision of freedom in a virtual space, gamers have the ability to fulfill desires that they may not be able to meet in reality. For instance, they can choose to portray a better version of themselves, explained by Gil-Or and colleagues (2015) as the notion of having a False Online Self. These false self-presentations can be achieved through gameplay where gamers take on different character roles and control the actions and choices of the online character. For example, a gamer can take on a dominant personality and assert dominance over other players through defeating other online characters, which may be different from the gamer's personality in reality (Wei et al., 2017). Additionally, this virtual space allows for gamers to escape from real-life stressors due to its immersive nature (Wei et al., 2017), develop bonds with other players, and feel a sense of mastery and achievement (Pawlikowski & Brand, 2011). These benefits afforded to gamers through online freedom coincides with key developmental tasks of adolescents, such as independence from authority and freedom to make personal choices, thus providing an attractive source to fulfill their desire for autonomy (Ong and Tan, 2014). According to research by Billieux et al., (2013), MMORPG and MOBA games also facilitate identity construction, which is a key developmental task in adolescence. Adolescent players are drawn toward online communities in multiplayer games, which aid in their search for an identity and culture to take reference from as they build their own identities (Billieux et al., 2013).

Secondly, the anonymity that the online game world affords its users allows users to reduce self-inhibition (Catalano & Hawkins, 1996) and behave without need for responsibility (Bowman et al., 2011). According to the Social Development Model, self-inhibition is defined as the suppression of behaviours which are deemed as socially deviant or are perceived as undesirable to social acceptance (Catalano & Hawkins, 1996). Online games rarely require users to reveal their identification to other game players and instead provide options to play under pseudonyms. Under these circumstances, players have freedom from direct judgement by others and can exhibit abnormal behaviours, which are often antisocial in nature (Ma, 2011). Without the need to display social desirability in an online world, players display reduced activation of self-inhibition, engage in higher risk-taking, and display higher aggression, which can generate high psychological rewards, which may further bolster the reward experience in the virtual world. Catalano and Hawkins (1996) found that in the digital environment, with reduced anonymity, players exhibited more antisocial behaviours, which was mediated by a reduced need for self-inhibition.

According to Whang and Chang (2004), when rewards from achieving these desires in virtual gameplay outweigh negative outcomes, gamers may be motivated to continue playing despite the knowledge of negative costs. Negative costs include negative interference in daily activities, career prospects, and social relationships. Wei et al. (2017) echoes the motivating nature of psychological rewards, claiming that psychological rewards from gaming motivate higher consumption and may lead into compulsive behaviour over time in vulnerable individuals (Wei et al., 2017).

However, despite these elements designed with addictive mechanisms in mind, only a small population of gamers with high engagement levels suffer from negative impacts and display pathological gaming symptoms (Kiraly et al., 2017). This phenomenon seems to suggest that the underlying cause for IGD lies in the personal characteristics of gamers rather than the game itself. Gender (Gentile et al., 2010), age group (Festl et al., 2013, Mentzoni et al., 2011), psychological symptoms (Ong & Tan, 2014), personality, family and social environment (van den Eijnden et al., 2010), and motives to play are risk factors that have been associated with the manifestation of IGD (Kiraly et al., 2017; Griffiths et al., 2012).

Personal Characteristics - Predisposing risk factors

Gender has been established to be correlated with the development of IGD, with males forming a higher proportion of individuals diagnosed with the disorder, as compared to females (González-Bueso et al., 2018; Winkler et al., 2013). In Singapore, research by Gentile and colleagues (2010) have found that 12.6% of boys out of a study of 3000 adolescents were found to exhibit pathological gaming behaviour, while this was present among 4.6% of the girls. It is important to note that these studies were mostly cross-sectional in design, and so only correlational relationships can be inferred between gender and risk for IGD.

Younger age has also been found to be correlated to

higher prevalence of IGD (Festl et al., 2013; Mentzoni et al., 2001). Youth under 19 years in Germany had a 7.6 % prevalence rate of IGD as compared to 3.7 % among those 20 years and older (Festl et al., 2013). Research by Mentzoni et al. (2011) also found that IGD rates in males from the 16-21 age group and 22-27 age group were 15.4% and 9.7%, respectively, while prevalence rates in other age groups were under 3%. Statistics for Singaporean populations could not be obtained, as studies conducted in Singaporean populations (Gentile et al., 2010; Ong & Tan, 2014) focused mainly on the adolescent age group and prevalence rates for individuals beyond the targeted age group were not measured.

Personality traits and psychological symptoms have been associated with the development and maintenance of IGD (Cao et al., 2007; Charlton & Danforth, 2010; Ong & Tan, 2014; Park et al., 2014). Among the personality risk factors, impulsivity has been identified as a core element in IGD (Cao et al., 2007; Ong & Tan, 2014). Other personality traits, such as low agreeableness, high neuroticism, and low self-esteem (Charlton & Danforth, 2010; Park et al., 2014) have also been implicated in excessive Internet use and online gaming. Lower self-esteem, social isolation, and poor interpersonal skills also predispose an individual to higher psychological rewards from online games that allow one to develop online relationships and an online persona (Billieux et al., 2013; Park et al., 2014). In a study conducted by Gentile et al. (2010), that sampled 3034 Singaporean adolescent youths, researchers found that lower social competence and greater impulsivity acted as risk factors for pathological gaming behaviours. Anxiety, depression, and impulsivity have been associated with each other in a mediating relationship through the Behavioural Inhibition/Approach System (Park et al., 2013). The Behavioural Inhibition/Approach System theorizes that anxiety may be a mediator in which individuals turn to online gaming as a means of avoiding anxiety and other negative moods, such as stress and loneliness (Choi et al., 2014). Risks associated with family, such as perceived family disharmony, family dysfunction, and conflicting family relationships are risk factors involved in IGD as well (Bonnaire & Phan, 2017; Li et al., 2014; Wang et al., 2014). Stressors, such as major crises, bereavement, or life changes, are also external circumstances that can increase the likelihood of turning to online gaming (Throuvala et al., 2019).

Interventions

Based on the ubiquity of the Internet and the degree of reliance we have on technology, it is agreed that abstinence recovery models are not realistic and practical in treating IGD (Dong & Potenza, 2014; Young, 2010). Based on a systematic review of treatment methods, intervention strategies generally lean towards individual intervention (Lemos et al., 2014). Among the intervention strategies available, studies have lent some intervention methods more credence and evidence than others and thus will be discussed below.

Treatment Method 1: Cognitive Behavioural Therapy

Cognitive behavioural therapy (CBT) is founded on the theory that cognitions drive feelings and behaviour. In clinical settings, CBT in both individual and group therapy have been shown to have positive outcomes, particularly for individuals with mild Internet addiction, in which individuals displayed symptoms of preoccupation with Internet usage, hiding online usage and continued use of Internet despite knowledge of consequences (Ong & Tan, 2014; Young, 2007) and have the most evidence based research in its effectiveness across several substance-use disorders (DeVito et al., 2012). CBT has been employed in interventions for IGD as it can aid in improving inhibitory control ability, which is one of the core risk factors associated with IGD and recognizing maladaptive cognitions so that clients can work on developing adaptive decision-making (Huang et al., 2010). In particular, CBT-Internet Addiction (CBT-IA) was developed to address the specific dynamics in Internet addiction and is used in intervention for IGD as well (Young, 2011). Behavioural therapy is used to address computer behaviour, with the aim of abstinence from problematic applications and controlled productive use of devices. Cognitive therapy is then used to address maladaptive cognitions that lead to their online gaming behaviour, which includes combating rumination, all or nothing thinking, and extreme self-concepts that favour the online persona (Young, 2011). Cognitive restructuring is used in therapy to challenge these thoughts and re-evaluate the validity of these interpretations. Finally, harm reduction therapy is employed in the last phase of CBT-IA for the purpose of relapse prevention. Harm reduction therapy identifies and addresses other concurring issues linked to IGD, such as feelings of depression and anxiety following periods of abstaining from gaming behavior. The therapist and client address ways in which the client can mitigate these feelings so that risk of relapse can be lowered. While cognitive-behavioural therapies currently have a larger evidence base than other therapies mentioned here, it is not without limitations, and should not be mistakenly viewed as the most effective treatment method.

Treatment Method 2: Mindfulness

Mindfulness-based interventions have been well established in addressing stress and behaviours that are driven by negative-reinforcement motivations (Dong & Potenza, 2014). As stress factors have strong links with IGD, mindfulness-based therapies, such as Mindfulness Based Stress Reduction (MBSR), may be effective in lowering stress levels and inclinations to use gaming as a mode of escape or distraction from feelings of stress and anxiety. Mindfulness-Oriented Recovery Enhancement (MORE) has also been developed for IGD (Li et al., 2017). MORE involves increasing client's mindful awareness of the automatic behaviours associated with gaming, using mindful reappraisal, and mindful savouring of daily experiences to cope with negative affect and enhance positive affect, as well as mindful relaxation to reduce stress. Based on a systematic review of 21 randomized controlled trials involving mindfulness interventions, MBSR was found to reduce perceived stress, anxiety, and depression in clinical populations, but post-treatment effect beyond 4-weeks was not sustained (Fjorback et al., 2011).

Treatment Method 3: Pharmacotherapy

Pharmacotherapy, in the form of administering selective serotonin reuptake inhibitors (SSRIs), bupropion, and methylphenidate, have been found to be effective for individuals with comorbidities in gaming addiction and mood disorders (Griffiths et al., 2012; Han et al., 2010, 2009). Pharmacological treatment has also been found to be comparable to that of psychotherapy in the efficacy of decreasing the time spent online and improving Internet addiction (Winkler et al., 2013).

However, controlled studies on the long-term efficacy beyond the post-intervention stage have yet to be conducted, hence it is unclear as to whether medication confers benefits in the long-term as well as in other psychosocial indicators (King & Delfabbro, 2014). Additionally, the range and severity of symptoms that pharmacotherapy can effectively alleviate is still unknown (King & Delfabbro, 2014) and warrants further studies.

Combining Intervention Strategies and Modalities

Relying on any single intervention strategy comes with limitations and shortcomings. For example, in a review of CBT in IGD, participants exhibited behavioural change during treatment but showed a lack of motivation to find other alternatives as a replacement for time spent on online games, leading to a high relapse rate during post-intervention (Day, 2017). It is also observed that gamers are often coerced into seeking help by a third-party, such as family members (Griffiths & Meredith, 2009), leading to a decrease in motivation to begin with. Hence, without other interventions to enhance their motivation, behaviour change is unlikely to be maintained. In the same vein, while pharmacotherapy seems like a viable option given studies showing its effectiveness in reducing online gaming behaviour, these studies fail to consider the potential side effects from the medications administered. For instance, methylphenidate treatment was suggested as a possible treatment for IGD and involves the administration of methylphenidate, a stimulant drug, which was conventionally

used to treat attention disorders like Attention Deficit Hyperactivity Disorder. In a clinical study for methylphenidate treatment, it was reported that 51.6% of participants had ceased treatments due to psychiatric or medical problems (Han et al., 2009), raising concern over the potential side effects and long term effects of pharmacotherapy.

To address these shortcomings, clinicians typically incorporate several aspects of different interventions to supplement and enhance treatment for an individual. Family therapy is a common adjunctive treatment modality for IGD and is used alongside CBT (Yen et al., 2007). To integrate the broader family environment into intervention, systemic motivational therapy (SMT) has been adapted for IGD (Day, 2017). SMT was formulated by combining techniques from motivational interviewing with narrative therapy and incorporating them into family therapy with the client and non-abusing members of the family (Steinglass, 2008). In SMT, the counselor's role is to strengthen and facilitate the client's inherent motivation to change, and subsequently collaborate with the client and family system towards creating a plan for change (Day, 2017). Parental interest has been shown to be important for the amelioration of IGD symptoms in adolescents (Lin et al., 2009) and thus may be an effective intervention strategy to be used in conjunction with other forms of therapy.

Cultural Differences

It is necessary to note that cultural differences (Winkler et al., 2013; Voronov & Singer, 2002) can affect the evaluated effectiveness of the interventions discussed above. It is observed that studies in the United States report larger effect sizes than studies in Asia for certain outcome variables (Winkler et al., 2013), and differences in culture can account for some of this variance. In particular, in collectivist societies where adolescents are taught to prioritize group harmony and abide by family hierarchy, the Internet, and online gaming world are some of the first places where they explore their individuality and independent socialisation, thereby becoming a major source of identity formation (Billieux et al., 2013; Choi & Ross, 2006). Hence, undergoing psychotherapy may lead to a loss of their online identity, which makes up a large part of their individual identity as compared to their peers who live in more individualist societies (Choi & Ross, 2006).

In addition, cross cultural differences in the expression of disordered gaming behaviour exist, which further impacts effectiveness of treatment and intervention. Based on a study by Snodgrass et al. (2018), expression of problematic gaming behaviour and distress was studied across three regions: North America, Europe, and China. The study found that motivations and addictive factors of Internet gaming were shaped by culture, in terms of expression of social connection and disconnection, achievement motivations, and psychosomatic experiences. For example, social isolation was closely associated with addiction in North American and Chinese populations, while it was less closely related for the European population. Another way in which outcomes of IGD differed across the three cultures was the experience of loss of pleasure. Unlike North American and European populations, in China, loss of pleasure was also associated with feeling psychosomatically "drained," relating to loss of energy and other psychosomatic symptoms (Zhang & Wu, 2005). This suggests that practitioners should take into account the varying expressions and underlying psychological mechanisms of IGD across different cultures during the development of intervention strategies. However, due to the dearth of definitive evidence accounting for cultural differences (Winkler et al., 2013), more research is needed to make conclusive judgments and better tailor intervention strategies for each culture.

Overview of International Policies

According to a systematic review of policies addressing IGD, preventive actions and policies can be classified according to their policy aims and level of prevention (Kiraly et al., 2018). Policy aims include measures limiting availability of video games, reducing risk and harm, and providing assistive services for gamers (Kiraly et al., 2018). The levels of prevention are divided into three different levels (universal, selective and indicative), which target different populations within the country (Kiraly et. al., 2018).

Policy Aims

Given the addictive potential of video games, one strategic aim is to limit availability and access to online games. The underlying reasoning is that if gamers are able to reduce the time spent on online games, the high barriers to entry can dampen the development of problematic behaviour on a macro level (Kiraly et al., 2018). These preventive actions and policies may be enforced by governments or by providing monitoring tools and controls to other stakeholders (such as parents or gamers themselves). Examples of policies limiting availability include shutdown systems, fatigue systems, and selective shutdown systems, tabulated in Table 1. Shutdown systems are enforced by governments which restrict access to online game servers between specific times in the day. Fatigue systems involve the reduction of in-game rewards after playing for a specified amount of time, which are meant to discourage underage users from playing for prolonged periods of time. Selective shutdown systems have also been instituted in South Korea, where individuals can request gaming service providers to block access to gaming for a given amount of time (Kiraly et al., 2018). These policies and preventive efforts have been adopted in different countries, in which countries like Thailand and Korea adopt several policies to be used in tandem with each other. Table 1 provides the countries and stakeholders involved in the enforcement of these policies.

Secondly, policies reducing risk and harm aim to reduce the impact of negative consequences associated with IGD. These policies intend to help gamers play in a more responsible and healthy manner, or mitigate the hazards within the game play itself (Kiraly et al., 2018). One example includes mandatory in-game warning messages related to the risks of excessive game playing, analogous with the health warning messages that appear on tobacco and alcohol packaging. They also involve rating systems created by independent self-regulatory organizations representing the interactive software sector in Europe and the video game industry in the United States. These rating systems help consumers (mostly parents or caregivers) make informed decisions on buying age-appropriate video games. However, for now, these rating systems are currently limited to evaluating content and age-appropriateness rather than overuse. Examples are shown in Table 2.

Another intervention strategy could involve providing assistive services to problematic gamers, whose gaming behaviour has led to negative outcomes and interference in daily living. This burgeoning public health issue has led to the demand for proactive intervention, coming in the form of prevention and treatment programs. The most common intervention programs are that of CBT(King & Delfabbro, 2014), but other forms of therapy (e.g. mindfulness, systemic-motivational therapy) are becoming increasingly

Table 1

Preventive Action and Policies and Countries/Stakeholders involved in implementation for Limiting Availability

Preventive Action/Policy	Countries Involved	
Shutdown System	Thailand (Park & Ahn, 2010), Vietnam, South Korea and China	
Selective shutdown policy	South Korea (Game Industry Promotion Act 12.3)	
Fatigue System	China (Li & Zhou, 2016)	
Limiting gaming time in Internet cafes	Thailand (Park et al., 2013), Korea (Kiraly et al., 2018) and	
	Singapore (Ong & Tan, 2014)	

Table 2

Preventive Action and Policies and Countries/Stakeholders Involved in Implementation for Reducing Risk and Harm

Preventive Action/Policy	Stakeholders Involved
In-game Warning Messages	Used by companies like Blizzard Entertainment,
	ArenaNet and Nintendo
Rating Systems	Entertainment Software Rating Board (2016), Pan
	European Gaming Information (PEGI) rating
	system
Parental Controls, Time Limits and Monitoring	Available on gaming platforms (Xbox, Wii,
	Playstation) and operating systems (Windows,
	Android, iOS

available as well (Kuss & Lopez-Fernandez, 2016). Governments are also developing master plans and building up public health competencies to better deal with IGD (Koh, 2015; Stone, 2009). Examples of various treatment services are shown in Table 3.

Levels of Prevention

Prevention strategies can be identified according to their target populations. These levels of prevention are known as (1) universal prevention; (2) selective prevention; and (3) indicative prevention.

Universal prevention refers to policies targeting all populations in the country, regardless of their risk level. Such strategies are developed in three main forms through the provision of education, legislative action and technological measures (King et al., 2018). Provision of education includes offering resources about cyber wellness, digital literacy courses, and healthy alternatives, with the aim to reduce reliance on Internet-based activities (World Health Organisation, 2015) and can be provided through public awareness campaigns. Legislative action includes shutdown policies, as implemented by countries like Thailand and South Korea, while technological measures include the provision of parental controls that are built within software operating systems.

Selective prevention targets individuals who are at higher than average risk for developing problematic gaming behaviour. In many countries, policies are geared towards adolescents and youths, who are particularly vulnerable to the development of IGD (King et al., 2013). Thus, selective prevention strategies include regular screening measures in schools and universities, as well as school-based educational programs (Busiol & Lee, 2015; Shek & Yu, 2013).

Indicative prevention targets subgroups showing symptoms of problematic gaming. However, due to the fact that IGD has yet to be formally recognized as a disorder within the DSM, this tentative status as a disorder has made it difficult for these individuals to be medically and legally recognized in

Table 3

Preventive Action and Policies and Countries/Stakeholders involved in implementation for Provision of Help Services

Proventive Action/Policy	Countries/Stakeholders Involved
Freventive Action/Policy	Countries/ stakenoiders involved
Private and Non-Governmental Treatment Centres	United States: The Center for Internet Addiction
	United Kingdom: Broadway Lodge treatment
	center
	Singapore: Touch CyberWellness, The Cabin,
	MeToYou
State-owned/Public Treatment Centres	China: General Hospital of Beijing Military
	Region's Internet Addiction Treatment Center
	(Huang, Li, & Tao, 2010; Stone, 2009)
	Singapore: National Addictions Management
	Service (Ong & Tan, 2014)
	Korea: Internet Addiction Prevention and
	Counseling Center (Koh, 2015)

certain countries, such as the United States or Australia (King et al., 2013). Nevertheless, there have been strategies implemented either by governments, community groups, or private help services. These prevention strategies include community support groups, treatment centers, and psycho-education. Several examples on the type of help services available can be found in Table 3.

Interventions and Policies in Singapore

Singapore's policy approach primarily focuses on reducing risk and harm of IGD, particularly for adolescents (Ong & Tan, 2014). Policies reducing risk and harm include public awareness campaigns and education, such as the Better Internet Campaign which advocates for safe use of the Internet, as well as cyber wellness education incorporated within the national school curriculum (Ministry of Education, 2018). Other efforts are brought to schools through non-profit agencies, like Touch CyberWellness, which carry out programs from primary levels to post-secondary, educating youths on the dangers and consequences of excessive gaming.

Policies aimed at limiting availability in Singapore include the regulation of cyber cafes under the Public Entertainments and Meetings Act (Cap 257, 2001 Rev Ed). The Act regulates the use of cyber cafes by minors, which include prohibiting minors wearing school uniforms from entering cyber cafes, and placing restrictions on operating times for minors. (Infocomm Media Development Authority, 2021).

Finally, there are many mental health services available to individuals who have been identified with problematic gaming behaviours. Governmental agencies like National Addictions Management Service have been set up by the Institute of Mental Health to provide services for individuals with addictions, including IGD. Non-profit agencies like Touch Cyber-Wellness, MeToYou, and the Cabin Singapore provide youth and their parents with intervention programs and counseling. These programs focus on the promotion of self-awareness through structured and experiential learning processes which connect the adolescents back to healthier Internet use habits (Touch CyberWellness, 2019; The Cabin, 2019). Other programs, such as the Internet & Gaming Addiction intervention by WE CARE Community Services, involve individual sessions and optional family sessions, working one on one with clients depending on their needs under indicative prevention. Among intervention programs in Singapore, CBT, family therapy, and psychoeducation are the most common treatments (Ong & Tan, 2014). Schools also refer students with symptoms of gaming disorders to seek counseling from counselors in school, who have basic training in dealing with IGD. (Ong & Tan, 2014) In more severe cases, under the advice of professionals from the Response, Early Intervention, and Assessment in Community Mental Health (REACH) programme, school counselors may refer students to child psychiatric services, the National Addictions Management Service, or to other programs in the community.

Evaluation of Singapore's Intervention strategies and Policies

Although it appears as if several steps have been taken to address problematic video game playing, most of these steps were not as effective as expected, or had not been evaluated empirically for efficacy. The reason for this may lie in the fact that the policies outlined only addressed or influenced specific aspects of the problem instead of using a more integrative approach.

One potential obstacle barring a more integrative approach could be conflict of interest. In another recent review of international policies and their effectiveness, the phenomenon of conflict was found to be the most noticeable in the area of "gaming," whereas the phenomenon of overlapping roles was most evident in the area of "youth" (Kiraly, 2018). Kiraly posits that this conflict may stem from the competitive efforts of policymakers to maintain their own budgets, resulting in current conflicting and overlapping roles in existing policies, which developed independently under the separate policy goals of each government department (Kiraly, 2018).

This phenomenon can perhaps be elucidated in the current environment in which helping services and school counseling are developing independently of each other, resulting in a mismatch in best practices and actual interventions carried out in schools. According to research by the Institute of Mental Health (IMH) (2014) in Singapore, interventions by non-profit agencies, like Touch CyberWellness and The Cabin Singapore, focus on the client's social functioning and skills within the context of social environment, and are built on evidence-based best practices in emerging research (IMH, 2014). On the other hand, interventions by school counselors are primarily focused on reducing the symptoms of pathological video-gaming in individual settings. A survey by IMH (2014) also found that the school counselors felt that they could be better equipped with more training and workshops on assessment and intervention skills, rather than generic information and knowledge about pathological video-gaming. This highlights the knowledge and skills gap between government sanctioned counselors in schools and counselors in non-profit help agencies.

Discussion of Future Directions

To summarise, this literature review introduced IGD and explored the controversy surrounding its definition and prevalence rates. Determinants of the online gaming behaviour were also presented, aiding understanding into the multitude of risk factors that interplay to produce these behaviours. Next, several intervention methods of IGD were offered so that advantages and disadvantages of different intervention methods can be compared against each other, giving a more holistic view about their effectiveness and limitations. However, to adequately evaluate the current interventions, more systematic reviews and evaluations have to be conducted, with special care to increase randomization, blinding, and control groups to obtain results that have higher clinical validity (King et al., 2017).

Through the study of policy strategies internationally and in Singapore, the merits of using a combination of interventions and policies are also elucidated. Employing a combination of policies using different aims and levels of prevention can help to alleviate the limitations of using just one method, and reach different target populations. Internationally, many countries have adopted a myriad of preventive actions and policies, tailored to specific policy aims and levels of prevention. Countries like Korea and Thailand adopted policies geared toward limiting availability, while the United States, United Kingdom and Singapore favoured policies reducing harm and providing help services (Kiraly et al., 2018; Ong & Tan, 2014). Through the evaluation of Singapore's policies, the challenges identified come in the form of integrating the efforts and directions of different stakeholders and resolving conflicting interests, thereby acknowledging gaps in expertise and knowledge and moving forward with multiple stakeholders coming together to tackle a common goal.

In conclusion, it is evident that certain challenges still plague the study of IGD. Without further clinical and theoretical research and discourse on the definition of the disorder, as well as clinical studies on the symptoms of populations diagnosed with IGD using the current assessment tools, IGD is unlikely to be included in the DSM any time soon. Several other factors, such as disputes about the specific diagnostics of IGD due to its departure from the conventional addiction symptomatology displayed in substance-related addiction disorders (Griffiths et al., 2016; Kaptsis et al., 2016) and the confusion between expression of non-pathological engagement in gaming and pathological gaming behaviours (Charlton & Danforth, 2007), prevent the arrival of international consensus on the inclusion of IGD in the DSM-5. Bringing the definition and diagnostic criteria of IGD closer to clinical validity and general consensus is crucial for subsequent downstream actions, which include measuring accurate prevalence rates, conceptualizing interventions, and policy actions.

Internationally, the formal inclusion of IGD in the DSM-5 is foundational to the coordination of prevention policies (King et al, 2017), as it gives governments the impetus to treat the disorder as a public health issue. Locally, parallel with the increasing recognition of IGD, more people exhibiting symptoms of problematic behaviour are seeking help from community help services (Touch Community Services, 2018), and the Singaporean government is seeking to improve its competencies addressing IGD (Ministry of Education, 2018; Institute of Mental Health, 2018). Hence, the refinement of the definition of

IGD to reflect a more clinically valid and accurate representation of the disorder is needed so that all stakeholders can tackle the disorder effectively in the interests of the public

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