



TEXAS WOMAN'S
UNIVERSITY

Student Journal

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ABOUT THE COVER



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Kim Wasson Eagan is an MFA candidate in Studio Arts with an emphasis on Photography at TWU. This work, *Transcend*, was originally exhibited in the 2019 John Weinkein Juried Student Exhibition, and captures something of the spirit we hope to evoke in this inaugural issue. The figure seems to dance with the elements, reflecting on her relationship with water and air, imagination and mind. This reflection is a source of light. As we engage together in our practices of open scholarly publication, may we all shed more light for each other through reflection and research in our disciplines. We intend to continue reflecting the spirit of TWU in future covers.

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We would like to thank the TWU Libraries' Design Specialist, Sean Spear, for designing our journal cover.

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Welcome to the brand new *TWU Student Journal*!

WHY WE'RE DOING THIS

Over the last two decades, scholarly communication (defined as the system through which research is created, evaluated, and distributed) has undergone several transformations. The most significant are electronic scholarly journals and open access (OA) journals. The rapid development of Information and Communication Technologies (ICTs) has transformed the way scholarly content is created, organized, stored and evaluated, and has enabled the proliferation of OA publishing. We believe students play a significant role in advocating for and supporting technological solutions to support OA publishing. Thus, by engaging students in the scholarly publishing process, we are not only providing a platform where they can disseminate their work, but, as mentors, we are also fostering academic growth early in their careers. The current project extends the vision shared by OA proponents of utilizing ICTs in transforming scholarly communication by actively engaging students and faculty in scholarly publishing processes.

Ultimately we dream of a journal completely run by students, but with mentorship and training from the editorial team. This will enable the next generation of emergent leaders in scholarly publishing at Texas Woman's University to truly learn by doing.

OUR STORY

Work on the TWU Student Journal began in Fall 2020 with the idea that presentations intended for the Spring Research Symposium, canceled by the pandemic, could find a stage.

But, that's not *quite* the whole story.

The germ of an idea was born when one of our editorial staff members reviewed yet another wonderful paper, and (again) had the thought that it could be a really interesting article. Quickly the idea burst the boundaries of a single department, becoming one where all students in all programs could publish, where we could support and mentor the development of quality writing, and where we could help those who plan to publish in their careers to gain experience and confidence in the processes involved – including writing, peer review, copy editing, layout, and social media marketing.

We are – after all – all in this together. In fact, this describes how we feel about managing the journal.

WHO WE ARE

There are 5 of us right now – two Library & Information Studies professors, and three staff members from the TWU Libraries, all on the Denton campus. You can read about us on the next page. We also have a new advisory board, and asked them to introduce themselves (see 'Meet our advisory board'). They'll be helping us to build the journal, and importantly, to help spread the word to students, faculty, and staff. None of us has expertise in the

sciences, or the humanities, so it's important that we find people who are immersed in these and other areas.

MEET OUR EDITORIAL TEAM

School of Library & Information Studies Faculty:

Ahmet (Meti) Tmava, PhD, wrote his dissertation on faculty perceptions of open access repositories. Dr. Tmava designed and is teaching a graduate course on scholarly communication, and serves as a peer reviewer for several academic journals.

Carol L. Perryman, PhD, is also co-editor for the official journal of the Medical Library Association Research Caucus, *Hypothesis*, and has served as section editor for the open access journal *Evidence-Based Library & Information Practice*. Her research and teaching interests include critical evaluation and research in practice.

TWU Libraries Staff:

Adrian Shapiro, MLS, Digital Projects Librarian, serves the TWU community with her involvement in the Texas Digital Library and the management of the university's open access repository, the Repository@TWU.

Elizabeth Headrick, MLS, PhD Student in Rhetoric, is focused on Open Access and Open Educational Resources, Graduate Assistant for Digital Collections. She served on the Texas Conference on Digital Libraries Awards Committee for several years, currently works at the TWU Library as a Graduate Assistant, and is performing expert copyediting for *TWUSJ*.

Kenneth (Woody) Evans, MLIS, is the Research and User Experience Manager at Blagg-Huey Library, as well as a PhD Student in Rhetoric. He was a series editor for Chandos Publications in 2012. He was also a librarian at Tarrant County College, at an Air Force base in New Mexico, and at Zayed University in Dubai, UAE.

In this issue, our authors present research from various disciplines including biology, social work, nursing, health sciences, and education.

Thanks to our excellent student writers for their contributions!

MEET OUR ADVISORY BOARD

Ashley Bender, PhD, Assistant Professor in English, Speech & Foreign Languages

As an assistant professor in English dedicated to the professional development of all students, I am delighted to join the advisory board of the TWU Student Journal. I bring with me a commitment to helping students develop their identities as researchers and scholars. I bring to this role over twenty years of experience supporting students through their journeys of becoming stronger writers and researchers, and I have an established record of and take great pride in helping students prepare their work for public presentation be it through conference presentation or publication.

Diana Elrod, PhD, Director of the Center for Student Research, and Senior Lecturer

As the Director of the Center for Student Research, I am pleased to support the Texas Woman's University Student Journal. This effort is valuable and necessary for both our students and our institution. The value of student research and creative activities are far reaching and life changing for many. These endeavors can light the fire of curiosity that will continue throughout their professional careers. These transformational experiences are complete when the work becomes public and this is accomplished through publication. It is our responsibility to both support the communication and celebration of our faculty and student collaborations and to foster a multidisciplinary community of scholars and artists. The Center for Student Research fully supports the journal and thanks the team for their dedicated labor in the design and the implementation of this effort.

Jorge Figueroa, PhD, Associate Dean of Research, Inclusion & Innovation, College of Professional Education, Associate Professor of Bilingual & ESL Education, Department of Teacher Education

In the College of Professional Education (COPE), we encourage and support our students to carry out scientific investigations that are dynamic, changing, and evolutionary. This is why many undergraduate and graduate students participate in research in conjunction with their professors. It is part of the teaching process and a tool to build knowledge and solve applied and practical problems. The Texas Woman's University Student Journal (TWUSJ) offers students a unique opportunity to disseminate their research while learning the correct publication process. In addition, it allows faculty to join students and embark with them in the process.

As Associate Dean for Research, Inclusion, and Innovation, in COPE, I am committed to fostering the scientific research of our students and promoting best practices in the publishing process. I support the TWUSJ and invite everyone to submit their articles. Don't wait anymore and get published!

¡A publicar!

Holly Hansen-Thomas, PhD, Vice Provost for Research and Innovation, Dean of the Graduate School, Professor of Bilingual & ESL Education.

I am so pleased to have a high quality outlet for student research and publication at Texas Woman's. The TWUSJ will fill an important gap, and serve many students!

Studying Rhesus Cytomegalovirus (RhCMV) to Develop Therapeutics for Human Cytomegalovirus (HCMV)

Naomi Akhidenor¹

Abstract:

Cytomegalovirus (CMV) is an evolutionarily divergent virus with unique species specificity limiting its ability to infect multiple hosts. The form of the virus specific to humans is known as human cytomegalovirus (HCMV). HCMV possesses pathogenic significance especially in immunocompromised individuals. As there remains a need to explore HCMV, limitations arise from the host restriction and inability to conduct vaccine development studies in human hosts. Rhesus Cytomegalovirus (RhCMV) is another opportunistic virus naturally isolated in Rhesus macaques and it contains most of HCMV gene families. In this review, primary research articles were sourced for information to better understand the relationship between HCMV and RhCMV. It explores how studying RhCMV in its natural host presents a preeminent model for prevention of HCMV infection and will aid in the development of vaccines and therapeutics.

1. Introduction

HCMV is a double stranded DNA virus and member of the herpesviridae family (16). It was first isolated in the year 1881 in the kidney cells of a luetic stillborn child and thought to be protozoan cells (34). Between the years 1956-1957, this double stranded DNA virus was individually isolated by different scientists; Thomas Weller, Margaret Smith, and Wallace Rowe in humans and in mice (18). One of the defining characteristics of these isolates was intranuclear inclusions found on the cells (18). Weller had isolated the virus from a child initially thought to have congenital toxoplasmosis (38). It was then that Weller named the virus “Cytomegalovirus”, alluding to the big cells that result from its infection. HCMV infects various cell types such as epithelial cells, endothelial cells, smooth muscle cells, fibroblasts, monocytes, and macrophages (32) which play a role in HCMV dissemination from host to host. It is important to note that HCMV infection and disease are not to be used interchangeably; infection represents the presence of viral proteins or nucleic acid in any body fluid or tissue regardless of symptoms, while disease is characterized by infection with attributable signs and symptoms of tissue-invasive disease (19).

Just like any other herpesvirus, HCMV is able to establish latency. Latency is a state where the virus is not cleared but is non-infectious and non-replicating for the lifetime of the host

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(35). The virus is able to establish latency through mechanisms of transcriptional silencing (13). It also has a lytic phase which may precede latency during natural infection. During the lytic phase, the virus is capable of releasing new virions and is highly infectious. Latent infection may be triggered to lytic infection by inflammation, bacterial infection and other injuries common to many cell types (13).

For a virus to survive, it must elude the immune surveillance of its host (31). HCMV is highly adept in escaping immune detection due to its ability to establish latency amongst other mechanisms. In addition, CMV's species specificity has made it harder to develop vaccines for target human populations. This review provides an overview of HCMV's characteristics and infection and gives prominence to how RhCMV in the rhesus model is suitable for providing more insight on HCMV.

2. Epidemiology

HCMV can be transmitted through bodily fluids, sexual contact, transplacentally from mother to child, and through breast milk. HCMV infection is endemic amongst various populations. Data shows that IgG antibodies (which indicate a previous HCMV infection) are found in approximately 60% of adults in developed countries and 100% in developing countries (15). In the United States, over 50% of adults are infected with HCMV by the age of 40, and approximately one in three children are infected with HCMV by the age of five (9) yet, there is no FDA-approved vaccine against HCMV (7). So far, treatments for HCMV infection include ganciclovir and valganciclovir which have side effects such as headache, dizziness, tremors, nausea, diarrhea, fever, renal dysfunction, and bone marrow suppression (23).

Congenital HCMV infection occurs in approximately 35% of pregnancies in which maternal primary infection is present (36). HCMV infection is a leading cause of disability due to hearing loss, impaired vision, cognitive impairments and neuromotor deficits (28). HCMV can also spread from mother-to-child through breast milk. The epidemiological impact of breast milk mother-to-child-transmission is amplified by the fact that infants shed the virus in saliva and urine for years (28). Because of this, children could further transmit HCMV to other family members or neighbors that they come in contact with, hereby increasing its prevalence.

In immunocompetent individuals, HCMV infection is often asymptomatic or mildly symptomatic; however, for those who are immunocompromised, it may lead to serious diseases. One of the most common diagnoses of HCMV disease occurs in organ transplant recipients due to transmission from transplanted organs or reactivation of a latent infection due to immune suppression. The virus induces a cytopathic effect on the recipient's organs and systems causing broad and febrile complications such as pneumonia, gastrointestinal tract disease, hepatitis, encephalitis, and retinitis that are sometimes fatal (5). Since HCMV disease can be a major cause of morbidity and mortality in these populations, prophylactic measures must be taken before and even after organ transplantation.

HCMV is also a common opportunistic infection comorbid with AIDS. HCMV in the blood (viremia) is reported to be a predictor of many CMV associated end-organ diseases (30). In 85% of AIDS related cases, the end-organ disease caused is retinitis (15). Aside from retinitis, other incidences of HCMV associated end-organ diseases include pneumonitis, hepatitis, and adrenalitis (14). When HCMV disseminates in a host with HIV infection, it can stimulate the host's immune response which leads to the production of antigens that consequently stimulate HIV replication (14). Taking this into consideration, it is important to explore how HCMV influences the course of HIV disease and AIDS in order to manage the co-existence of HCMV and HIV/AIDS in target populations.

HCMV threatens the quality of life for many people regardless of age or gender, but people from lower socio-economic backgrounds are even more at risk of its attack. With HCMV's significant prevalence in the general population, there is an urgent need to develop novel therapies that will control the spread and manage infections of this virus.

The Rhesus Model

Rhesus Cytomegalovirus, RhCMV is another opportunistic virus that naturally infects Rhesus macaques (*Macaca mulatta*). It has co-evolved with its host and is also highly species-specific. Rhesus macaques normally live in large mixed cohorts (i.e some are infected with RhCMV and some are not) where it has been shown that RhCMV spreads throughout the cohort as a function of the persistent shedding of the virus in bodily fluids of infected animals and the repeated mucosal exposure of uninfected animals to the virus (11). Much like HCMV, RhCMV can be detected in various cell types in the body and sheds in bodily fluids (2).

Scientists have isolated different strains of RhCMV for investigative purposes and the most common are strains 68-1 and 180.92 (3). RhCMV strain 68-1 is a prototypical strain that was isolated from urine of healthy rhesus macaques in 1968 and propagated in human fibroblasts (10). A complete genomic sequence analysis of RhCMV strain 68-1 revealed that it contained 135 out of 260 open reading frames (ORFs) which are homologous to HCMV, and these include include members of the RL11, UL25, UL82, US1, US6, US12, US22, and seven-transmembrane protein families. (33). Out of other animal specific variants CMV which include murine CMV (MCMV), chimpanzee CMV (ChCMV), Guinea pig CMV (GPCMV), Cynomolgus CMV (CyCMV) and many more RhCMV is the closest evolutionary animal model to HCMV (24, 20) so it is able to serve as an alternative animal model to study HCMV infections.

Studies have been done to characterize RhCMV gene products. Its immediate early 1 and 2 (IE1/IE2) gene and promoter region indicated a conservation of gene structure, protein sequence and transcript with HCMV's IE1/IE2 (1, 6). RhCMV also encodes homologs to HCMV phosphoprotein 65 (pp65) which is a target for the immune response to HCMV (39). The conservation of the immune system targets IE1/IE2 and pp65 makes RhCMV a practical model for studying potential HCMV vaccines (33).

Another characteristic RhCMV shares with HCMV is a viral interleukin-10 (vIL-10) homolog known as RhCMVIL-10. The role of RhCMVIL-10 in regulating a host's immune response is among the popular studies for vaccine targeting against RhCMV infection. One study which utilized vaccines to disrupt RhCMVIL-10 mediated signaling showed that the destruction of RhcmvIL-10 restricts long-term features of primary RhCMV infection such as the amount of RhCMV that can be detected in the saliva and urine of vaccinated/challenged rhesus macaques (12). The evidence suggests that vIL-10 in HCMV could also suppress the functions of cell types that are critical in containing virus dissemination and help shape long-term immunity during the earliest virus-host interactions (12).

Cellular receptors for the Fc domain of immunoglobulin G (IgG) (FcγRs) comprise a family of surface receptors on immune cells connecting humoral and cellular immune responses (4). They happen to be key determinants in antibody-mediated immune responses (20). RhCMV gene Rh05 (which is comparable to UL153 in HCMV) encodes an IgG-Fc binding glycoprotein (17, 20). Using a set of reporter cell lines expressing human and rhesus FcγRs, it was demonstrated that Rh05 protects infected cells from opsonization and IgG-dependent activation of host FcγRs (20). This feature could be employed as a mechanism that allows the virus to disseminate despite humoral and cellular responses (20) and as more studies are done with the rhesus model, the results will be able to discern the impacts of HCMV viral FcγRs on immunomodulation.

An important highlight is that RhCMV encodes five genes that share homology (i.e., similar structure or function) with HCMV chemokine receptor US28 namely, Rh214, Rh215, Rh216, Rh218 and Rh220 (17). These five genes encode proteins with seven transmembrane domains that are homologous to G protein-coupled receptors (GPCRs) (17). Clustal analysis showed that these genes vary from each other and HCMV US28 (29). It further revealed that Rh220 is able to bind to ligands like fractalkine (also known as CX3CL1) just like HCMV US28 (29). This raises the question: What other functional similarity does Rh220, and the other replicate genes share with US28? Further research would be useful in determining the evolutionary significance of these replicate genes in RhCMV and it could also help elucidate the significance of US28 in HCMV.

Viral GPCRs

GPCRs, also known as seven-transmembrane domain receptors, are found on the surface of the cell and produce a signal or response after the binding of a ligand. Once activated, the G proteins transduce signals from the cell surface to an effector molecule in order to modulate intracellular functions (17). GPCRs are popular drug targets because of their ability to regulate various physiological processes in the body. HCMV encodes four GPCR homologs namely: UL33, UL78, US27 and US28 (37). Among the four listed, three (UL78, US27 and US28) are known to play a role in HCMV dissemination and latency (37). It is currently hypothesized that HCMV's US27 and US28 genes arose via gene duplication (8). pUS27 has no known ligands to date but is found within the cell membrane of infected cells

(25). pUS28 on the other hand is a functional chemokine receptor that binds to various ligands (22).

A lot of studies have been conducted focused on characterizing the role of US28 during HCMV infection. Recent data revealed that US28-mediated signaling is important for maintaining latency (21). It was found that US28 is involved in the suppression of the major immediate early promoter (MIEP) which is a strong lytic promoter, and such activity is a major determinant for a successful latent infection (21).

US28 functions as a promiscuous chemokine 'sink' with an ability to bind to and internalize chemokines thereby limiting their dissemination and interfering with its host's immune activity (26, 25). US28 binds CXC and CC groups of chemokines which play a role in homeostasis and inflammation. In particular, it binds to CX3CL1 (fractalkine) through a two-site interaction mechanism (27, 29). At the first site, the receptor N-terminal region binds a groove on the globular body of the chemokine. At the second site, the chemokine N-terminal peptide binds within a deep pocket formed by the receptor transmembrane helices (TMs) that functions as the receptor activation switch (27). Since CX3CL has the ability to mediate migration, proliferation and adhesion of cells, one implication of US28 binding to CX3CL1 is that it can activate new signaling pathways (26) which will in turn promote HCMV's survival in the host. Given that RhCMV's Rh220 shares a similar binding profile with HCMV's US28, Rh220 could be useful in investigating other implications of US28 binding to various other chemokines.

3. Conclusion

HCMV has undergone co-evolution with its hosts and as such, has increased its specificity to its host's species. The virus's ability to establish latency means it never clears from the host. Scientists are curious to understand the various ways it avoids and modulates its host immune system. RhCMV in the Rhesus model presents an adequate means for such studies. Particularly, characterizing RhCMV's US28 homologous genes would provide better insight on HCMV US28 as a tool for establishing latency and immune evasion. By further understanding viral latency in the Rhesus model system, we will be better informed on vaccine targets and drug developments against HCMV.

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Establishing *C. elegans* as a model to study the function of vitamin A metabolism

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Tina L. Gumienny³

Abstract: Vitamin A is critical for cell development, maintaining a healthy immune system, regulating energy metabolism, and eyesight in mammals. In addition, abnormal levels contribute to obesity and cancer. While vitamin A plays these many roles, what is not well known is the impact of individual vitamin A metabolism genes at the cellular level. We asked if the roundworm *Caenorhabditis elegans*, an established animal model system with a sequenced genome and established methods for genetic and cellular analyses, is appropriate for the study of vitamin A metabolism. Our objective was to determine if the *C. elegans* genome contains genes encoding potential vitamin A metabolism genes. We performed literature and database searches and identified potential retinoid metabolism genes in the *C. elegans* genome. Furthermore, some of these genes share phenotypes with their mammalian homologs. These genes include cellular retinol-binding proteins, retinol dehydrogenases, retinal dehydrogenase, cellular retinoic acid-binding proteins, and retinoic acid receptors. However, many of these genes in *C. elegans* and mammals have no known mutant traits. We conclude that the roundworm *C. elegans* may be an excellent model organism for this investigation because all expected genes are conserved. Future research in *C. elegans* will define the functional conservation of the vitamin A metabolism pathway in *C. elegans* and will characterize the physiological relevance of altered and normal vitamin A metabolism at the cellular level.

1. Introduction and literature review

Vitamin A is the general term for several functional compounds that are important nutrients (Ross & Harrison, 2007; Tanumihardjo et al., 2016). These compounds include the precursor vitamin A carotenoids, predominantly β -carotene, α -carotene, and β -cryptoxanthin, which can be obtained from consuming certain fruits along with orange, yellow, or green vegetables such as squash, carrots, collards, spinach, pumpkin, kale, and sweet potatoes. Other compounds stem from active vitamin A. These include retinyl esters and retinol which are found in liver and liver oil from meats and fish, eggs, cheese, and butter. Retinyl esters are the main type of vitamin A in human systems. All-trans retinoic acid (atRA) is the most

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biologically active form of vitamin A. This form alone can improve cell differentiation, development, and prevent fatality in animals with vitamin A deficiency.

Vitamin A is crucial for many animals. In mammals, it is essential for stable eyesight, embryonic development, reproduction, immune activity, cell and tissue differentiation, and the hair cycle (Everts, 2012; Tanumihardjo et al., 2016). Vitamin A deficiency can cause xerophthalmia in the form of night blindness and corneal irregularities, such as keratomalacia (maceration of the cornea) and ulceration, which can lead to permanent blindness. Vitamin A deficiency can also elevate the danger of progressing diarrheal and respiratory infections. It can slow bone growth, growth rate, and decrease recovery from critical illnesses. This deficiency can manifest in the skin as follicular hyperkeratosis linked with sebaceous glands, modification in the thickness of skin, and proteins such as keratin. Birth defects, embryonic death, and hair loss (alopecia) are associated with this deficiency as well as excess storage. Mutations in genes encoding vitamin A metabolism proteins result in traits like those observed with vitamin A deficiencies (Napoli, 2012). Hypervitaminosis A (excess levels of stored vitamin A in the body) can cause lethal symptoms such as dizziness, headache, nausea, vomiting, poor muscular coordination, blurred vision, pain in joints, and irregular liver activity. There is no treatment for hypervitaminosis A, other than reducing the intake. In invertebrates, RA also affects development, consistent with an ancient requirement for vitamin metabolism in animals (Albalat, 2009). The roundworm *Caenorhabditis elegans* stores reservoirs of retinal and RA upon vitamin A supplementation. These stores play a role in fat storage and mobilization and contribute to survival in starvation and high-glucose conditions (Chen et al., 2018).

Identification of mammalian vitamin A metabolism genes

The vitamin A metabolic pathway converts retinol to forms that can be stored or used by cells (Figure 1) (Belyaeva et al., 2020; Napoli, 2012). The liver, which stores the greatest quantity of vitamin A, discharges retinol combined with retinol-binding protein (RBP) into the blood. The transmission of retinol into cells is accompanied by the interaction of RBP and the extra-hepatic plasma membrane receptor, STRA6, which carries it across the cell membrane. Cellular retinol-binding proteins (CRBPs) then bind the retinol and direct the flow of retinol in and out of storage. Lecithin: retinol acyltransferase (LRAT) converts retinol into retinyl esters (RE) for storage. Retinyl ester hydrolase (REH), converts RE into retinol by hydrolysis RE activated by CRBP. LRAT obtains retinol for esterification as it enters storage. The first and second retinol dehydrogenations (RDH) in the pathway convert retinol into retinal. Three retinal dehydrogenases (RALDH) irreversibly dehydrogenate retinal into atRA. Cellular retinoic acid-binding proteins (CRABPs) deliver atRA to retinoic acid receptors (RARs) for transcription or they deliver it to three members of the cytochrome P450 gene family for catabolism.

Evolutionary conservation

The RA system is common to all metazoans (Albalat, 2009). Specifically, retinoid-binding proteins, RA metabolic enzymes, and RA-binding nuclear receptors have been identified in deuterostomes and protostomes. However, the RA system is more streamlined in some species than others. RAR, for example, appears to have vanished in numerous invertebrate species. Similarly, the bilaterian stem retained CYP26, while invertebrate lineages lost this enzyme or preserved it differently. Yet, every species (except the sea urchin *S. purpuratus*)

that retained RAR also retained the CYP26 and RALDH1 enzymes. *C. elegans*, the organism of our study, has retained the RAR subfamily, CYP26, and RALDH1 (Kostrouch et al., 1995). This suggests that retinoid-mediated transcription occurred in ancient organisms (Baker, 1998). STRA6, a critical gene involved in mammalian vision, underwent purifying selection in many vertebrates in regard to habitat surroundings (Wu et al., 2014). This gene may have evolved in vertebrates to maintain retinoid homeostasis and buffer retinoid inconsistencies in natural habitats (Albalat, 2009). However, invertebrate homologs of STRA6 have not been identified (Albalat, 2009).

Problems and questions in the vitamin A field and opportunities with studying vitamin A metabolism in *C. elegans*

Previous research has revealed that *C. elegans* can metabolize vitamin A into retinal and RA (Chen et al., 2018). The *C. elegans* predicted RBP homologs FAR 1-6 have been shown to bind to retinol (Garofalo et al., 2003). A partial *C. elegans* vitamin A metabolism pathway has been predicted (Yilmaz & Walhout, 2016). This evidence suggests that there is a conserved vitamin A pathway in these nematodes, however, most of the enzymes in the pathway have not been identified yet (Chen et al., 2018). Conducting this study on mammalian models poses limitations of cost and time. Also, looking at the cellular and subcellular localization of tagged enzymes would be difficult because mammals are opaque. This limits us from determining which enzyme family members are most important for vitamin A metabolism. However, *C. elegans* is an excellent model for this study because it is a transparent organism, whose cellular details can be seen with ease. Its short and reproducible life span provides great timing to see significant results at its different developmental stages. Also, conducting studies on these nematodes are less costly.

2. Methods

Mammalian vitamin A metabolism genes and phenotypes were identified through previous research from the Napoli lab (Napoli, 2012). Genecards.org, uniprot.org, and genenames.org databases were used to find names of specific human protein sequences. The National Center for Biotechnology Information BLASTP protein database search engine was used to identify *C. elegans* homologs of the known human vitamin A metabolism proteins (<https://www.ncbi.nlm.nih.gov/>). The top hits are presented in the findings section. Published phenotypes were extracted using wormbase.org.

3. Findings

To identify potential vitamin A metabolism genes in the *C. elegans* genome, we collected the protein sequences of human vitamin A metabolism proteins and identified candidate *C. elegans* homologs by sequence homology using BLASTP, an online search tool that identifies similar protein sequences in an extensive protein database to a submitted protein sequence (Figure 1). While no clear traits are associated with aberrant levels of vitamin A in *C. elegans*, we identified the known traits associated with these potential vitamin A metabolism genes

Diagram illustrating the retinoid signaling pathway:

- Retinoid Entry:** RBP-Retinol (LBP-3, 8, 9) and STRA6 (-) lead to CRBP-Retinol (LBP-3, 8, 9).
- CRBP-Retinol Interactions:**
 - CRBP-Retinol (LBP-3, 8, 9) is in equilibrium with Retinyl Esters (Storage) via REH.
 - CRBP-Retinol (LBP-3, 8, 9) is converted to Retinal by RDH5, DHRS9, RDR-5, DHS-2,16, RDH10, DHS-3, 4,19, and DHRS3, DHS-3, DECR-1.2, F02C12.2.
 - Retinal is converted to atRA by RALDH-1, 2, 3 and ALH-1, 2, 3, 10, 11.
- atRA Interactions:**
 - atRA is in equilibrium with CRABP1-atRA (LBP-5, 6, 7) and CRABP2-atRA (LBP-5, 6, 7).
 - atRA leads to RAR - No RA (SEX-1, NHR-1, 10, 35, 64, 91) and RAR + RA (SEX-1, NHR-1, 10, 35, 64, 91).
 - RAR - No RA is associated with Repressed Transcription.
 - RAR + RA is associated with Activated Transcription.
- Retinoid Degradation:** atRA is degraded by CYP26A1, CYP-23A1, CYP-29A4, CYP-34A5, CYP26B1, CYP-13A8, CYP-35A1, CYP-35A3, CYP26C1, CYP-13A1, CYP-13A4, and CYP-13A12.

Identification of *C. elegans* CRBP/ RBP-like retinol-binding protein candidates

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No STRA6-like chaperone was identified in the *C. elegans* genome

STRA6 is a chaperone that helps bring retinol into the cell, but is found only in vertebrates. No *C. elegans* homolog for STRA6 (AAQ89447.1) was identified.

Identification of *C. elegans* LRAT candidates

EGL-26 was identified as a potential homolog of human LRAT by querying BLASTP with LRAT, accession number PDM82548. WHT-4, ABC transporter domain-containing protein, was identified as a potential homolog of human LRAT by querying BLASTP with LRAT, accession number NP_494495.3.

Identification of *C. elegans* dehydrogenase candidates

DeHydrogenases, Short chain family, were identified as potential homologs of human RDH5 and DHRS9. DRD-5 (NP_509415.2), DHS-2 (NP_871815.1), and DHS-16 (NP_504554.1) have high homology to human RDH1 (NP_002896.2) and DHRS9 (NP_001363853.1). DRD-5 was identified as a potential homolog of human RDH5 and DHRS9 by querying BLASTP with RDH1 and DHRS9, accession number NP_509415.2. DHS-16 was identified as a potential homolog of human RDH1 and DHRS9 by querying BLASTP with RDH1 and DHRS9, accession number NP_504554.1. DHS-2 was identified as a potential homolog of human RDH1 and DHRS9 by querying BLASTP with RDH5 and DHRS9, accession number NP_871815.1.

DeHydrogenases, Short chain family, were identified as potential homologs of human RDH10. DHS-3 (NP_001122508.1), DHS-4 (NP_492563.1), and DHS-19 (NP_505915.1) have high homology to human RDH10 (NP_742034.1). DHS-3 was identified as a potential homolog of human RDH10 by querying BLASTP with RDH10, accession number NP_001122508.1. DHS-4 was identified as a potential homolog of human RDH10 by querying BLASTP with RDH10, accession number NP_492563.1. DHS-19 was identified as a potential homolog of human RDH10 by querying BLASTP with RDH10, accession number NP_505915.1.

DeHydrogenases, Short chain family, were identified as potential homologs of human DHRS3. DHS-3 was identified as a potential homolog of human DHRS-3 by querying BLASTP with DHRS-3, accession number NP_001122508.1. DECR-1.2 was identified as a potential homolog of human DHRS-3 by querying BLASTP with DHRS-3, accession number NP_495805.1. F02C12.2 was identified as a potential homolog of human DHRS-3 by querying BLASTP with DHRS-3, accession number NP_510229.1.

Identification of *C. elegans* RALDH-1, 2, and 3 candidates

The Aldedh domain-containing protein family contains potential homologs of human RALDH-1, 2, and 3. ALH-1 (NP_498081.2) and ALH-2 (NP_503467.2) have high homology to human RALDH-1 (NP_000680.2), 2 (NP_003879.2), and 3 (NP_000684.2). ALH-1 was identified as a potential homolog of human RALDH-1, 2, and 3 by querying BLASTP with RALDH-1, 2, and 3, accession number NP_498081.2. ALH-3, 10-formyltetrahydrofolate dehydrogenase, was identified as a potential homolog of human RALDH-1, 2, and 3 by querying BLASTP with RALDH-1, 2, and 3, accession number NP_502054.2. ALH-11 was identified as a potential homolog of human RALDH-1 by querying BLASTP with RALDH-1, accession number NP_001367351.1. ALH-10 was identified as a potential homolog of human RALDH-2 by querying BLASTP with RALDH-2, accession number NP_509203.1. ALH-2 was

identified as a potential homolog of human RALDH-3 by querying BLASTP with RALDH-3, accession number NP_503467.2.

Identification of *C. elegans* CRABP 1 and 2 candidates

The Lipid Binding Protein family contains potential homologs of human CRABP1 and 2. LBP7 (NP_506440.1), LBP-6 (NP_491926.1), and LBP-5 (NP_491928.1) have high homology with human CRABP 1 (NP_004369.1) and 2 (NP_001869.1). LBP-7 was identified as a potential homolog of human CRABP-1 and 2 by querying BLASTP with CRABP-1, accession number NP_506440.1. LBP-6 was identified as a potential homolog of human CRABP-1 and 2 by querying BLASTP with CRABP-1, accession number NP_491926.1. LBP-5 was identified as a potential homolog of human CRABP-1 and 2 by querying BLASTP with CRABP-1, accession number NP_491928.1.

Identification of *C. elegans* RAR α , β , and γ candidates

The Nuclear Hormone Receptor family contains potential homologs of human RAR α , β , and γ . NHR-91 (AAG15183.2), NHR-35 (NP_001024365.1), and NHR-64 (NP_001343721.1) have high homology to human RARA (NP_000955.1). NHR-91 (AAG15183.2), NHR-64 (NP_001343721.1), SEX-1 (NP_001024662.1), and NHR-1 (AAO39170.1) have high homology to human RARB (NP_000956.2). NHR-91 (AAG15183.2), NHR-1 (AAO39170.1), NHR-10 (AAO39172.1) have high homology to human RARG (NP_000957.1). NHR-91 was identified as a potential homolog of human RAR α , β , and γ by querying BLASTP with RAR α and β , accession number AAG15183.2. NHR-35 was identified as a potential homolog of human RAR α by querying BLASTP with RAR α , accession number NP_001024365.1. NHR-64 was identified as a potential homolog of human RAR α and β by querying BLASTP with RAR α and β , accession number NP_001343721.1. SEX-1 was identified as a potential homolog of human RAR β by querying BLASTP with RAR β , accession number NP_001024662.1. NHR-1 was identified as a potential homolog of human RAR β and γ by querying BLASTP with RAR β and γ , accession number AAO39170.1. NHR-10 was identified as a potential homolog of human RAR γ by querying BLASTP with RAR γ , accession number AAO39172.1.

Identification of *C. elegans* cytochrome candidates

The cytochrome P450 superfamily contains potential homologs of human CYP26A, B, and C. CYP-23A1 (NP_494797.1), CYP-34A5 (NP_504099.1) and CYP-29A4 (NP_505490.2) have high homology to human CYP26A1 (NP_000774.2). CYP-23A1 was identified as a potential homolog of human CYP26A1 by querying BLASTP with CYP26A1, accession number NP_494797.1. CYP-34A5 was identified as a potential homolog of human CYP26A1 by querying BLASTP with CYP26A1, accession number NP_504099.1. CYP-29A4 was identified as a potential homolog of human CYP26A1 by querying BLASTP with CYP26A1, accession number NP_505490.2. CYP-13A8 (NP_496115.1), CYP-35A3 (NP_504121.1), CYP-35A1 (NP_001343612.1) have high homology to human CYP26B1 (NP_063938.1). CYP-13A8 was identified as a potential homolog of human CYP26B1 by querying BLASTP with CYP26B1, accession number NP_496115.1. CYP-35A3 was identified as a potential homolog of human CYP26B1 by querying BLASTP with CYP26B1, accession number NP_504121.1. CYP-35A1 was identified as a potential homolog of human CYP26B1 by querying BLASTP with CYP26B1, accession number NP_001343612.1. CYP13A4 (NP_496111.1), CYP-13A1 (NP_496108.1), CYP-13A12 (NP_499705.1) have high homology to human CYP26C1 (NP_899230.2). CYP-13A4 was identified as a potential homolog of human CYP26C1 by

querying BLASTP with CYP26C1, accession number NP_496111.1. CYP-13A1 was identified as a potential homolog of human CYP26C1 by querying BLASTP with CYP26C1, accession number NP_496108.1. CYP-13A12 was identified as a potential homolog of human CYP26C1 by querying BLASTP with CYP26C1, accession number NP_499705.1.

The cytochrome P450 superfamily contains potential homologs of human CYP2S1. CYP-33C5 (NP_503616.1), CYP-34A1 (NP_506787.1), CYP-31A2 (NP_502152.3) have high homology to human CYP2S1 (NP_085125.1). CYP-33C5 was identified as a potential homolog of human CYP2S1 by querying BLASTP with CYP2S1, accession number NP_503616.1. CYP-34A1 was identified as a potential homolog of human CYP2S1 by querying BLASTP with CYP2S1, accession number NP_506787.1. CYP-31A2 was identified as a potential homolog of human CYP2S1 by querying BLASTP with CYP2S1, accession number NP_502152.3.

Enrichment of putative vitamin A metabolism genes in intestine and hypodermis

Although the tissues that metabolize vitamin A in *C. elegans* are not known, the tissues that do process vitamin A should also express the necessary proteins. If the candidate genes we identified are co-expressed, that would increase our confidence that these genes may act in the same pathway. Therefore, we compared the tissue localization of candidate genes with published expression patterns. 22 of 53 candidate vitamin A metabolism genes have known expression in the intestine. This enrichment of candidate genes in the intestine is consistent with the roles of the intestine in processing bacteria, the source of vitamin A for *C. elegans*, and storing lipids, which retinols regulate (Chen et al., 2018).

Mammalian protein	<i>C. elegans</i> candidate gene	References
A. <i>C. elegans</i> genes with clear non-lethal, non-sterile phenotypes		
CRBP (RBP)	<i>lbp-3</i>	(O'Rourke et al., 2013)
CRBP (RBP)	<i>lbp-8</i>	(Folick et al., 2015)
CRBP (RBP)	<i>lbp-9</i>	(Arda et al., 2010; Ha et al., 2006)
LRAT	<i>egl-26</i>	(Hodgkin, 1986; Piano et al., 2002; Shephard et al., 2011; Trent et al., 1983)
DHRS3	<i>decr-1.2</i>	(Ashrafi et al., 2003)
RALDH-1, 2, and 3	<i>alh-3</i>	(Minogue et al., 2018)
RALDH-1, 2, and 3	<i>alh-10</i>	(O'Rourke et al., 2006)

CRABP 1 and 2	<i>lbp-7</i>	(Green et al., 2009)
CRABP 1 and 2	<i>lbp-6</i>	(Ha et al., 2006)
CRABP 1 and 2	<i>lbp-5</i>	(Fraser et al., 2000; Xu et al., 2011)
RARA	<i>nhr-35</i>	J-C. Martinou, unpublished
RARA	<i>nhr-64</i>	(Liang et al., 2010)
RARG	<i>nhr-10</i>	(Arda et al., 2010; MacNeil et al., 2013)
CYP26A1	<i>cyp-23a1</i>	(Kraemer et al., 2006)
CYP26B1	<i>cyp-35a3</i>	(Ashrafi et al., 2003)
CYP26B1	<i>cyp-35a1</i>	(Menzel et al., 2005)
CYP26C1	<i>cyp-13a4</i>	(Kamath et al., 2003; Simmer et al., 2003)
CYP26C1	<i>cyp-13a12</i>	(Ma et al., 2013)
CYP2S1	<i>cyp-33c5</i>	(Cui et al., 2007; Liu et al., 2012)
B. <i>C. elegans</i> genes with lethal or sterile phenotypes		
RDH1 and DHRS9	<i>dhs-16</i>	(Zhang et al., 2013)
RDH10	<i>dhs-3</i>	(Maeda et al., 2001)
RALDH-1, 2, and 3	<i>alh-1</i>	(Consortium, 2012)
RARA	<i>nhr-91</i>	(Zhao et al., 2004)
RARB	<i>sex-1</i>	(Carmi et al., 1998; Kamath et al., 2003; Rual et al., 2004; Simmer et al., 2003; Sonnichsen et al., 2005)
CYP26B1	<i>cyp-13a8</i>	(Kamath et al., 2003)
CYP2S1	<i>cyp-31a2</i>	(Benenati et al., 2009; Kamath et al., 2003; Piano et al., 2002; Rual et al., 2004; Simmer et al., 2003; Sonnichsen et al., 2005)
C. <i>C. elegans</i> genes with no published phenotype		

LRAT	<i>wht-4</i>	
RDH1 and DHRS9	<i>drd-5</i>	
RDH1 and DHRS9	<i>dhs-2</i>	
RDH10	<i>dhs-4</i>	
RDH10	<i>dhs-19</i>	
DHRS3	F02C12.2 / DHRS3- like	
RALDH-1, 2, and 3	<i>alh-2</i>	
RALDH-1, 2, and 3	<i>alh-11</i>	
RARB	<i>nhr-1</i>	
CYP26A1	<i>cyp-34a5</i>	
CYP26A1	<i>cyp-29a4</i>	
CYP26C1	<i>cyp-13a1</i>	
CYP26A1	<i>cyp-34a1</i>	

Table 1. Table of identified vitamin A metabolism gene candidates in *C. elegans* by phenotype.

4. Conclusions

Here, we identified possible vitamin A metabolism genes and gene families based on protein homology with known mammalian genes (Table 1, Figure 1). Most of the nematode homologs were identified through databases, while a few homologs were identified through previous research. Phenotypes and available strains for each homolog were identified for most of the homologs through databases. We believe many of these genes are crucial for these nematodes based on their phenotypes.

Many of these gene families may have functions other than vitamin A metabolism, such as lipid metabolism and reduction of high-glucose toxicity (Chen et al., 2018). Many of the identified genes are required for survival, development, immune responses, and reproduction (Table 1). They are required but their molecular function is not known. Our work will focus on confirming the specific enzymes and genes whose products are required

for vitamin A metabolism in *C. elegans*. Further research could determine the possible interaction between vitamin A and nematode immunity. In addition, previous research discovered a novel *C. elegans* fatty-acid and retinol-binding protein family (FAR) (Garofalo et al., 2003). Future directions will focus on identifying whether these proteins compensate for lack of STRA6 to bring retinol into the cell.

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Relationships Between BSN-Prepared Nurses and Healthcare Outcomes in Hospitalized Patients: A Literature Review

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Abstract:

Background: The current healthcare system is constantly changing and dynamic, requiring nurses to manage various complex patient care needs and ensure patient safety and quality of care. The American Association of Colleges of Nursing and various nursing associations call for a minimum Baccalaureate entry level for nurses to produce quality patient outcomes.

Purpose: This literature review identifies and synthesizes the existing evidence of the impact of Bachelor of Science in Nursing (BSN)-prepared nurses on hospitalized patients' outcomes.

Methods: A systematic search of library databases was conducted to find full-text articles published between 2014 and 2019 in English. The screening focused on empirical studies that used the sample of BSN-prepared nurses as an independent variable and examined the relationships between BSN-prepared nurses and patient outcomes. Nine articles met the inclusion criteria and were reviewed.

Results: Evidence revealed that having a higher proportion of BSN-prepared nurses in hospitals showed a significant effect on lower patient mortality rate, lower patient length of stay, lower readmission, lower failure to rescue, and greater odds of cardiac arrest survival.

Conclusion: This literature review found evidence that having a higher proportion of BSN-prepared nurses resulted in better patient outcomes in the hospital setting. However, more research is needed to examine the impact of BSN-prepared nurses on other patient outcomes extensively. Hospital administrators and nurse leaders are encouraged to support resources for the more BSN-prepared nurse workforce.

Keywords: Education, Nursing, Baccalaureate, Hospital, Quality of Healthcare

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Introduction

In the report, *To Err is Human: Building a Safer Health System*, the Institute of Medicine (IOM, 2000) estimated there are as many as 98,000 patient deaths per year due to medical errors in hospitals in the United States. Since this publication, there has been considerable progress in improving patient safety in healthcare through endorsement from organizations such as the Joint Commission, the Agency for Healthcare Research and Quality, and the National Quality Forum, to name a few. However, healthcare medical error-related deaths continue to rise to more than 250,000 cases per year (Makary & Daniel, 2016).

Nursing discipline has extensively engaged in improvement in patient safety and quality of care in practice and research over the past decades. While associations among nurse staffing characteristics, work environment, nursing care, and patient outcomes have been studied, in 2003 Aiken and her colleagues provided research evidence in support of registered nurses with a bachelor of science in nursing degree (BSN RNs) to make a positive impact on patient outcomes in hospitals. As part of a two-year initiative by the Robert Wood Johnson Foundation to transform the nursing profession, the recommendation was made to increase nurses' proportion with a baccalaureate degree or higher to 80% by 2020 (IOM, 2010). According to the 2018 annual report by the American Association of Colleges of Nursing (AACN; 2018), 49% of employers required new nurses to have a BSN, and 86% of employers preferred to hire new nurses with a BSN for better patient outcomes. The AACN report for 2019(a) showed the percent of nursing workforce holding a BSN degree or higher was at 56%.

Evidence is needed to support the national recommendation to increase the proportion of BSN RNs for quality patient care and outcomes. This literature review identifies and synthesizes the existing evidence of the impact of nurses with a baccalaureate degree on patient outcomes in the hospital setting. Findings from this literature review can be used to support the national recommendation for BSN RNs as the minimum entry-level into practice, as well as for healthcare agencies to execute a nursing workforce policy of employing a higher percentage of BSN RNs to reduce the risk of poor patient outcomes.

Methods

Search Process

A systematic search was conducted on September 30, 2019, utilizing PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases. A combination of medical subject headings (MeSH), CINAHL subject headings, and keywords related to nursing, baccalaureate, and health care was used with Boolean operators and truncation; the details are available in Table 1. The search was further limited to the full-text articles published from 2014/01/01 to 2019/12/31 in English. The PubMed search yielded 25 articles, and CINAHL yielded eight articles.

Inclusion and Exclusion Criteria

A Preferred Reporting Items for Systematic Research and Meta-Analysis (PRISMA) Flow Diagram describes the article selection process (see Figure 1). A total of 33 articles were initially found; after eliminating six duplicates, abstracts of 27 articles were further screened to retrieve the most relevant literature. The review included articles that should identify the sample of BSN RNs as an independent variable and examine the relationships between BSN RNs and patient outcomes. Studies that compared outcomes by RNs with a BSN and RNs with other degrees were included. We are not limited to studies conducted in the United States but included international studies, seeking evidence for a relationship between BSN RNs and patient outcomes. Study types for inclusion criteria included randomized control trials, quasi-experimental, prospective, and retrospective cohort studies, observational, case-control, and cross-sectional studies. Abstracts-only, proceedings, literature reviews, or systematic reviews were excluded. Two systematic reviews of the impact of the BSN degree on patient outcomes (Audet, Bourgault, & Rochefort, 2018; Haskins & Pierson, 2016) were found but not included in our literature analysis. In the Discussion section of this paper, we reviewed the findings from these literature reviews with the results from our literature review. Of the 27 articles, nine met the inclusion criteria and were reviewed. Each reviewer evaluated the articles independently and had meetings to obtain consensus on the reviews. The review of the studies is summarized in Table 2.

Results

Overview of the Studies

All nine studies were retrospective, quantitative, observational, cross-sectional studies using patient data linked to nursing care. The data analyses to examine the relationship between BSN RNs and patient outcomes included logistic regression (Cho et al., 2015; Harrison et al., 2019; Kelly, Kutney-Lee, McHugh, Sloane, & Aiken, 2014; Lane-Fall et al., 2017; Mahfoud et al., 2018; White, Smith, Trotta, & McHugh, 2018; Yakusheva, Lindrooth, & Weiss, 2014), generalized estimating equation (Aiken et al., 2014), and multilevel linear regression analysis (Cho, Park, Choi, Lee & Kim, 2018). Adjustments for patient risk and hospital characteristics in each study were discussed to avoid any confounding or extraneous variables such as patient comorbidities or hospital size and capabilities.

The age of patients ranged from 19 to 89 years old. The total sample size ranged from 1,064 to 422,730 hospitalized patients, 10 to 7,415 nurses, two to 12 medical units, and seven to 300 hospitals.

Data Sources

Regarding data sources, the years of data used in the reviewed studies went back to 2006, although the studies were published between 2014 and 2019. Therefore, the years of the data ranged from 2006 to 2019 were used in the literature review. Notably, most studies used datasets linked to data from multiple sources.

Aiken et al. (2014) used data linked with administrative data and surveys of nurses in 300 hospitals in nine European countries. Cho et al. (2015) linked staff nurse survey data and

surgical patient discharge data from 14 high-technology teaching hospitals in South Korea. Cho et al. (2018) combined nurse surveys with patient discharge data and hospital facility data. Harrison et al. (2019) analyzed data linked from three sources: patient data from American Heart Association's (AHA) Get With the Guidelines- Resuscitation registry, nurse data of the RN4CAST-US survey from 36 hospitals in California, Florida, New Jersey, or Pennsylvania, and the AHA Annual Survey to collect information on the total beds for hospitals in the US and their facilities structures and services. Kelly et al. (2014) combined multistate nurse survey data, hospital administrative data, and Medicare claims data. Lane-Fall et al. (2014) focused on nurses through cardiovascular intensive care unit (ICU) surveys linked to the administrative database of patients in Pennsylvania. Mahfoud et al. (2018) used patient admissions data directly linked with the admitting nurse. White et al. (2018) used Medicare Provider Analysis and Review data on inpatient hospitalizations, Beneficiary Annual Summary File data on beneficiary demographics, and the Multi-State Nursing Care and Patient Safety Survey of RNs in 531 hospitals in California, Florida, New Jersey, and Pennsylvania. Yakusheva et al. (2014) analyzed data of adult medical-surgical patient discharges matched with direct care nurses from an academic center.

Relationships Between BSN-prepared Nurses and Patient Outcomes

Length of Stay

The length of stay (LOS) for patients decreased with a higher proportion of BSN RNs (Cho et al., 2018; Yakusheva et al., 2014). Cho et al. (2018) determined that for every 1% increase in the number of nurses with a BSN, the LOS of surgical patients decreased by 0.42 days ($B(SE) = -0.42 (0.19), p = .025$). Yakusheva et al. (2014) concluded that a higher proportion of BSN RNs had a 1.9% shorter LOS of adult medical-surgical patients ($p = .03$).

Readmission

Yakusheva et al. (2014) was the only study to report a finding related to the odds of readmission; compared with patients with <80% portion of care from BSN RNs, patients received > 80% of care from BSN RNs had 18.7% lower odds of readmission in adult medical-surgical patients (OR 0.813, $p = .04$).

Mortality

Five studies revealed that a high proportion of BSN RNs was significantly associated with lower mortality rates (Aiken et al., 2014; Cho et al. 2015; Kelly et al., 2018; White et al., 2018; Yakusheva et al., 2014), and two studies did not find a significant relationship between them (Lane-Fall et al., 2017; Mahfoud et al., 2018).

Cho et al. (2015) discovered that each 10% increase in BSN RNs was associated with a 9% decrease in surgical patient deaths (OR 0.91, 95% CI 0.83 – 0.99, $p = .03$). White et al. (2018) found that for all surgical patients, each 10% increase in the proportion of nurses holding a BSN or higher degree was associated with a 6% lower odds of death (OR 0.94, 95% CI 0.92-0.97, $p < .001$). For individuals without Alzheimer's disease and related dementias (ADRD), each 10% increase in the proportion of BSN RNs was associated with 4% lower odds of death (OR 0.96, 95% CI 0.93-0.98, $p = .002$), but it was associated with 10% lower odds of death (OR 0.90, 95% CI 0.87–0.94) for those with ADRD. Yakusheva et al. (2014) determined that

a 10% increase in the proportion of BSN RNs was associated with 10.9% reduction in mortality of adult medical-surgical patients (OR 0.891, $p < .01$).

Aiken et al. (2014) showed that every 10% increase in BSN RNs was linked with a decrease in patient deaths by 7% (OR 0.929, 95% CI 0.886-0.979, $p = .002$). This study determined that hospitals in which 60% of nurses had a BSN and cared for an average of six patients would have almost 30% lower mortality than patients in hospitals in which only 30% of nurses had BSN and cared for an average of eight patients. Kelly et al. (2018) revealed that each 10% increase in the proportion of ICU nurses with a BSN was associated with a 2% reduction in the odds of 30-day mortality of older adults on mechanical ventilation (OR 0.98, 95% CI 0.97-0.99, $p < .05$); this study concluded that the odds-on patient deaths in hospitals with 75% of BSN RNs would be 10% lower than in hospitals with 25% nurses with a BSN. Lane-Fall et al. (2017) reported that, in patients with emergent procedures at ICUs, 30-day mortality was higher in the unit with more than 33% of the proportion of less experienced nurses with BSN degree but was not significant (OR 0.94, 95% CI 0.76–1.17, $p = .593$). Mahfoud et al. (2018) also did not find a statistically significant relationship between the portion of BSN RNs and mortality rates of inpatients in hospitals in Qatar (OR 1.32, 95% CI 0.569 - 3.156, $p = .501$); this study analyzed inpatients in a wide mix of specialty areas including medical, obstetric, oncology, pediatric, and surgical units.

Failure to rescue

Failure to rescue is failure or delay in recognizing and responding to a hospitalized patient experiencing complications from a disease process or medical intervention (Hall, Lim, & Gale, 2020). White et al. (2018) found that, for all surgical patients, each 10% increase in the proportion of nurses holding a BSN or higher degree was associated with 6% lower odds of failure-to-rescue (OR 0.94, 95% CI 0.92-0.97, $p < .001$). With a 10% increase in the proportion of BSN degree or higher, there was 5% lower odds of failure-to-rescue (OR 0.95, 95% CI 0.92–0.98, $p = .002$) for individuals without ADRD but 10% lower odds of failure-to-rescue (OR 0.90, 95% CI 0.87– 0.94) for those with ADRD.

Cardiac arrest survival

Harrison et al. (2019) concluded that with each 10% increase in BSN RNs, there was 24% greater odds of surviving to discharge with a good cerebral performance for patients who experience an in-hospital cardiac arrest (OR 1.24, 95% CI 1.08-1.42, $p < .001$).

Discussion

The appropriate nursing workforce development is significant to supplying nurses enough to meet the health needs of the nation, and appropriate nursing education and training for the high quality of nursing care is essential (AACN, 2019). This literature review discovered that the higher proportion of BSN RNs in hospitals showed a significant effect on lower patient mortality rate (Aiken et al., 2014; Cho et al., 2018; Kelly et al., 2018; White et al., 2018; Yakusheva et al., 2014), lower patient LOS (Cho et al., 2018; Yakusheva et al., 2014), lower failure to rescue (White et al., 2018), lower readmission (Yakusheva et al., 2014), and greater

odds of surviving to discharge with good cerebral perfusion in a post-cardiac arrest setting (Harrison et al., 2019).

Two previous systematic reviews (Audet et al., 2018; Haskins & Pierson, 2016) identified the evidence of significant associations between nurse education and clinical experience and patient outcomes (e.g., mortality and adverse events) in acute care hospitals. Haskins and Pierson (2016) conducted a meta-analysis of nine studies published from 1965 to June 2014, in which only one article (Aiken et al., 2014) overlapped with our literature review. Their systematic review reported that patients who received care from nurses with a BSN or higher degree had 5% lower odds of mortality and 6% lessening in failure-to-rescue (Haskins & Pierson, 2016). Audet et al. (2018) analyzed 27 studies published from January 1996 to August 2017; three studies (Aiken et al., 2014; Cho et al., 2015; Yakusheva et al., 2014) overlapped with our literature review. Audet et al.'s (2018) systematic review found that nursing educational levels lowered patient mortality by 75% and failure-to-rescue by 61%. Our literature review discovered congruent findings that each 10% increase in the proportion of BSN RNs significantly lowered a range of 5 - 10% odds of deaths depending on the patient population and 6 - 10% odds of failure-to-rescue.

Evidence presented in this literature review and the previous systematic reviews reinforces consideration of a higher proportion of BSN RNs in the nursing workforce to provide quality care and improve patient outcomes and BSN as the minimum entry-level into nursing practice. BSN RNs may show more competence in providing care, decision making, accurate explanations, and patient engagements (Palese et al., 2017).

Implications for Nursing Practice

Hospital management teams should find ways to support and advocate for nurses to get advanced academic degrees or certifications with tuition reimbursement (Sarver et al., 2015; Yakusheva et al., 2014). Healthcare leadership teams should not view the hiring of BSN RNs as a financial liability but instead focus on the financial benefits from avoiding adverse outcomes with quality of care by BSN RNs (Harrison et al., 2019). The cost-effectiveness of an increased proportion of BSN RNs could be measured in future research along with patient outcomes, patient satisfaction, and nurse job satisfaction.

For ensuring patient safety and outcomes, it is necessary to consider the nursing workload in addition to the optimal proportion of BSN RNs. Studies showed that each additional patient per nurse was associated with a 5-7% increase in the odds of patient death within 30 days of admission (Aiken et al., 2014; Cho et al., 2015)). The nursing work environment also should be considered for improving patient outcomes. Cho et al. (2015) proved that the odds of patient mortality were nearly 50% lower in hospitals with better nurse work environments than in hospitals with mixed or poor nurse work environments. Kelly et al. (2018) revealed that critical care in patients with better nurse work environments had 11% lower odds of 30-day mortality than those in worse environments. Another factor to support BSN RNs to improve patient outcomes would be an effective collaboration with other healthcare personnel such as pharmacists and respiratory therapists, as Lane-Fall et al.'s

(2017) study proved. The AACN (2019b) has emphasized the importance of collaboration across the discipline for quality care.

Implications for Future Research

There have been few studies that examined the relationship between the BSN RNs and other nursing-sensitive outcomes such as catheter-associated urinary tract infections, pressure ulcers, ventilator-associated pneumonia, central line-associated bloodstream infections, or fall/fall injuries. In this literature review, and the ones previously discussed, only one study (Manojlovich et al., 2011) demonstrated BSN RNs decreased inpatient falls. More research is needed to examine the impacts of the BSN RNs on diverse patient outcomes.

All nine studies reviewed were based on cross-sectional, retrospective data analyses through the data integration processes from multiple sources. In the data integration process, there could be a discrepancy between nurse survey data and hospital data due to the time lag of hospital data availability. Staffing surveys and clinical outcome data recorded at different time points could create misclassification. Therefore, it is essential to design the interface of the hospital information system with nurse-sensitive outcomes and nursing interventions documented by each nurse. Also, it is necessary to connect the hospital administrative system containing nurse staffing with the clinical information system, enabling the integrated data of time-flagged patient outcomes, nursing care, and nurse information to provide more definitive evidence of the impact of BSN RNs on patient outcomes.

In the examination of relationships between nurse education level and patient outcomes, there could be many confounding factors, such as nurse staffing, nurse work environment, and interdisciplinary collaboration, as mentioned earlier. Also, the relationship could be influenced by the nurses' years of experience and autonomy (Mahfoud et al., 2018) or the severity of the comorbidities. Considering these potential confounding factors, careful analyses should be applied to carve out the impact of BSN RNs on patient outcomes.

Limitations

A systematic literature search strategy was employed for this literature review, however, there is a risk for missed articles due to constraints in years of publications, search filters, and search terms used. Although this review found significant impacts of the proportion of BSN-RNs on patient outcomes in the hospital setting, the scope of the investigated patient outcomes was limited. Further research is needed to document associations between the proportion of BSN RNs, quality nursing care, and extended patient outcomes, such as medical errors, hospital-acquired infections, or falls with injuries.

Conclusion

This literature review found evidence that a higher proportion of BSN RNs resulted in better patient outcomes in the hospital setting, including mortality, LOS, failure-to-rescue, readmission, and cardiac arrest survival. More research is needed to conduct an extensive examination of the impact of BSN RNs on positive and negative patient outcomes. Hospital administrators and nurse leaders are encouraged to support resources for a more BSN-prepared nurse workforce.

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African Immigrant Women and Mental Health

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Abstract:

A Pew Research Center 2015 report stated that 2.1 million African immigrants live in the US (Anderson, 2020). Among these immigrants, Nigerians have the largest population: 348,000 people (Gramlich, 2020). Prior research on African immigrants diagnosed with mental health disorders states that their women were the highest subset of this population who do not seek mental health treatment (Richards, n.d). Also, Nigerian immigrant women who experience severe mental illnesses such as schizophrenia, bipolar mood disorder, and depression do not typically seek professional help (Ezeobele & Malecha, 2010). Their reluctance may be due to their beliefs, stigma, discrimination, poor access to treatment, lack of resources, and lack of awareness about mental illness and treatment. They find their coping strategies through religious leaders and traditional self-care rather than seeking professional care (Ezeobele & Malecha, 2010; Ngui et al., 2011; Gberie, 2016). This paper examines why Nigerian immigrant women do not seek mental health care and suggests strategies and recommendations by which healthcare professionals could promote and increase awareness and education to improve the seeking of mental health treatment. These include improving access to mental health care, promoting social support and group therapy, and improving cultural competence to reduce healthcare disparities and distrust of treatment by African immigrant women.

1. Introduction

The migration of Nigerian immigrants from their countries to a new environment where they experience different values, morals, a new language, culture, stress, and anxiety of living contributes to their mental health problems (Ezeobele & Malecha, 2010). Nigerian immigrant women who experience severe mental illnesses are typically diagnosed with disorders such as schizophrenia, bipolar mood disorder, and depression (Ezeobele & Malecha, 2010). Nigerian immigrants share and support American values, assimilate into the culture, and still face discrimination and racial prejudice that contributes to these health problems (Ezeobele & Malecha, 2010). The present paper examines the hesitation to seek professional mental health treatment that Nigerian immigrant women experience in the

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United States, while also proposing recommendations to promote awareness and education for healthcare access and help-seeking.

Due to the rapid increase of Nigerian immigrants in the United States, this paper recommends creating avenues of awareness for Nigerian immigrants to seek mental health services; these might include engaging them in group therapy, teaching them how to overcome barriers surrounding mental health crises, and generally improving their wellbeing and health conditions. Sub-Saharan African immigrants, including Nigerian immigrants, face disparity and inequality in access to mental health services and treatment due to stigma, discrimination, and prejudice (Ngui et al., 2011). Lund (2018) gave three factors to explain African neglect of mental health treatment: “ignorance about the extent of mental health problems, stigma against those living with mental illness, and mistaken beliefs that mental illness cannot be treated.” Based on these factors, health practitioners need to take necessary measures. These include creating or increasing the awareness of mental disorders, reducing the fear of the stigma associated with treatment, eradicating mental health disparities, and offering culturally competent approaches to meet mental health services in group therapy (Williams, 2011).

2. Lack of Mental Health Services in Nigeria

Nigerian neglect of mental health services in their home country affects their understanding of how to seek mental health services in the US. World Bank Nigeria Overview of 2019 mentioned that Nigeria has approximately 202 million people, and from this population, Thelwell (2019) stated that 30% suffered mental illness and less than 10% received access to mental health care. The first mental health policy to address mental health issues regarding advocacy, promotion, prevention, treatment, and rehabilitation, was formulated in 1991 and is yet to be updated (Nwokolo, 2019). Mentally Aware Nigeria Initiative (MANI) is the major non-government organization fighting mental illness to end stigma; it enables people to seek mental health services without fear of discrimination and provides education on mental health care (Thelwell, 2019).

“Community-Based Mental Health Care in Africa: Mental Workers' Views” mentioned that African countries have fewer mental health professionals, less or no community-based care, and no social services; they depend on families, traditional healers, and religious leaders to deal with mental illness (Alem et al., 2008). For example, in 2017, when the Nigerian population was approximately 174 million, there were only 130 psychiatrists to provide services to the over 40 million people with a mental illness (Nwokolo, 2019). There should be a greater emphasis on finding and keeping more psychiatrists and mental health therapists in Nigeria.

Nigerians in Africa and abroad sometimes lack a clear understanding of mental health issues. They have a misconception that an evil spirit is the cause of mental illness and equate it with a spiritual attack, and that those with psychosis seizures are demonic or possessed by evil and can only be cured through traditional or spiritual intervention (Human Rights Watch,

2020; Lund, 2018; Gberie, 2017). Family members of the mentally ill rely on religious places or traditional healers where the mentally ill are detained, chained, emotionally and physically abused, and receive violent treatment (Human Rights Watch, 2020). Traditional healers use herbs and roots or perform rituals to treat and heal people affected with various diseases based on their beliefs; however, this intervention approach requires further research (Ezekwesili-Ofilu & Okaka, 2019).

Barriers to Mental Health Services faced by Nigerian Immigrant Women in the U.S.

Nigerian immigrants in the U.S. with mental illnesses are not seeking professional health services because they believe in spiritual/faith healing or have cultural barriers like stigma and labeling. Those who are interested in seeking professional mental health services also experience structural barriers such as lack of resources and insurance, lack of documentation, lack of knowledge of available resources, distrust of medical professionals, lack of cultural sensitivity, and discrimination (Derr, 2015).

Beliefs

Spiritual, religious, and cultural beliefs of African immigrant women hinder them from seeking mental health treatment (Omenka et al., 2020). Many Nigerian women have a high rate of spirituality and religiosity, believing in hope, faith, prayer, and that God has the power to heal them from any illness. Findings in research work on Mental Health Service among Immigrants in the United States confirmed that 23% of Nigerian immigrants establish that spiritual healing is their treatment strategy for mental illness (Derr, 2015). Prior research also states that 81% of African immigrant women acknowledge that faith helps them to cope with mental health problems (Derr, 2015). They find their strength and support in spirituality, which is why it is hard to convince them to seek mental health therapy. According to Branford, "It's the idea that if you pray about it, you'll feel better" (Allen, 2018). Allen (2018) reported, in an interview with Branford, a licensed psychologist and founder of Therapy for Black Girls, that culturally African immigrant women believe that they are strong and cannot reveal their struggles. They view depression as a sign of weakness (Allen, 2018), and only those who are weak or believed to be 'crazy' seek professional help (Ezeobele & Malecha, 2010). According to Branford, "the idea of being a 'strong black woman' keeps a lot of women from actually reaching out for help" (Allen, 2018).

Stigma

Nigerian immigrant women do not discuss or seek mental health treatment because of the stigma associated with mental illness. It is addressed, labeled, or considered mad or crazy in their social circle (Derr, 2015). Nigerian immigrants distrust the healthcare system, lack providers from diverse racial/ethnic backgrounds, and lack culturally competent providers (Omenka et al., 2020). The stigma of depression in the Nigerian culture does not affect only the person concerned, but also the entire family. They are isolated and rejected as other community members do not want to associate with 'madness'; therefore, they deny being diagnosed, and keep the secret within themselves (Ezeobele & Malecha, 2010). Delara (2016) observed that immigrant women prefer to share and discuss physical symptoms such as headaches and fatigue rather than expressing depression and anxiety disorders because

they see physical problems as more socially acceptable. Africans (Nigerians) generally would not share much about negative aspects of their lives with another party to avoid shame, disgrace, and humiliation (Said, 2018).

Bradford observed that therapists of the same ethnic background as the Black immigrant, particularly Nigerian immigrant women, are few, and these immigrants are not comfortable seeking help from white male therapists (Allen, 2018). American Psychology Association (2013) reported that 83% of active psychologists are white while only 5 % were African American (Willhoughby, 2018). Africans, especially Nigerians, prefer to discuss their problems with someone who looks like them, so the lack of representation becomes another barrier (Willhoughby, 2018). Additionally, African immigrants distrust health practitioners and believe that sharing their immigration status can lead to their deportation because they may lack proper paperwork (Olukotun et al., 2019).

Racism is another deterrent when seeking professional mental health services (Williams, 2011). It prevents African immigrant women from receiving adequate health care. Nigerian immigrant women have experienced racism and discrimination because they are black, women, and immigrants, and this may be undocumented by therapists. According to Williams (2020), when discussing how therapists drive away minority clients, she said, “insensitive remarks can be particularly harmful to vulnerable clients, who may already feel stigmatized and exposed by even attempting therapy.” Therapists and other health practitioners must be sensitive to the stigmatization faced by the Nigerian communities. They must be self-aware, knowledgeable, and have the skills that make them function effectively with the Nigerian population to reduce their fear about therapy, stigma, and distrust against them.

Lack of Resources

The barriers to lack of resources include financial difficulties, documentation, and knowledge. The cost of care for mental health services is expensive, and the uninsured, underinsured, or those receiving a lower income, might be at a disadvantage in seeking medical services (Delara, 2016). African immigrant women underutilized low-income mental health services because they are unaware that the services exist; or think that they need documentation of their immigration status to receive care (Derr, 2015). Black women including Nigerian immigrant women experience disparities in resources. Ungar (2020) stated that 21.5% of white women received mental health services compared to 10.3% of black women. The author mentioned that the racial disparities is devastating and believes that black women also need and deserve access to quality mental health services. Bauldry & Szaflarski (2017) stated in a study of immigrant-based disparities in mental health care that “approximately 17 percent of white adults use mental health services in a given year, compared with 9 percent of blacks.”

3. Statistics of Mental Illness for Nigerian American Women

Face to Face

A mental health community-based organization serving African immigrants in New York, an area of the country in which Nigerian populations are growing rapidly, conducted a health screening program in 2008. Within 18 months and 296 visits, 87 African immigrants attended the health screening, of which 52 were women. Among three medical problems (hypertension, mental health, and diabetes), mental health was at the top of the screening, with 87% of women being affected and only 5% of those with mental health problems adhering to taking prescribed medication (Venters et al., 2010). According to the National Institute of Mental Health, depression is one of the most common mental illnesses in the United States, affecting more than 12 million African women and more than 6 million men per year (Ward et al., 2013).

Nigerian women migrating to the U.S. need mental health care because of the stress they have gone through during migration. They face the challenges of post-immigration; basic needs like employment, housing, food, adjusting to the social system, and a new environment, which could harm their health. Also, they face the obstacle that they are getting mental health services less than other immigrant and non-immigrant groups (Adewunmi, 2015).

Effective Mental Health Strategies for Nigerian Immigrant Women

The Collaborative Care Model (1995), founded by Sharon Katz, was developed by the University of Washington. It was to treat common mental health conditions like depression and anxiety, identify the needs of mental health patients, bridge communication gaps among the health professionals and patients, and give them quality of care (Kaltman et al., 2011). Patients received evidence-based medication, clinical case consultation, social service intervention, and supporting interventions (Kaltman et al., 2011). Based on the population served from 2009 to 2010, 1,090 patients received treatment, and 78% were female (Kaltman et al., 2011). The Collaborative Care Model is well supported and effective in treating mental health cases in the community. Therefore, this study recommends its implementation to address the mental health needs of Nigerian immigrant women.

Suggested Approaches to Mental Health Treatment

Based on the rapid growth of the Nigerian immigrant women population in the United States, the current research suggests the need for group therapy among these populations to help them cope with mental health challenges. While spiritual and traditional methods can be helpful, professional help through group therapy would empower them and increase their sense of wellbeing to overcome barriers and fight the feelings of fear and misconception of mental illness. A social group would help these populations to connect and interact with other women experiencing similar situations and to feel a sense of belonging, empowering them to manage their negative feelings about seeking treatment.

Msengi et al. (2015) conducted a study of the Women of Care Project. It was an open social group for African immigrant women. Women who participated in this support group

program enjoyed the benefits of overcoming the barriers they face in discrimination and issues they have experienced that made it difficult for them to seek healthcare. African immigrant women were empowered through sharing and contributing to other women in the group. Those facing stressful life issues received coping skills and resources that improve their well-being (Msengi et al., 2015).

Miller (2021) defined cognitive-behavioral therapy (CBT) as the “intentional combination of demonstrated readiness and methodological rigor of behavioral procedures with the cognitive-behavioral processes that influence adjustment.” In other words, CBT, which helps people understand their thoughts to change their reactions and behaviors, would be an appropriate therapeutic intervention to correct the misinterpretation of the Nigerian immigrant women's thoughts that create disruption in their lives and to also treat those with mental health issues.

Wafula & Snipes (2013) suggested that designing educational programs would reduce the stigma immigrant women experience when seeking mental health treatment services and health professionals to guarantee their privacy, create rapport, and build trust together with them. The educational programs are appropriate for Nigerian immigrant women. It will enable them access to treatment, improve the professional attitudes and allow them to trust, be open, and satisfied with treatment. Wafula & Snipes (2013) mentioned that healthcare professionals should collaborate with religious and traditional leaders who are the Nigerian immigrants' sources of help to develop mental health interventions.

When these measures are met, seeking professional help would be more effective with Nigerian immigrants than traditional and spiritual methods. Health practitioners could reach out to these populations through medical doctors and informal support systems by offering free seminars that will target issues like stress management. They might also train more psychologists and other mental health professionals familiar with African values, norms, and customs, and change the perceptions of mental health agencies from being only American-oriented. This might change Nigerian immigrant attitudes and behaviors towards seeking professional help (Thomas, 2008).

Ponte (2019) discussed challenges she faced as an immigrant woman and a mental health patient. She suggested that doctors and therapists be culturally competent to treat immigrants' mental health problems. She encouraged developing more informational campaigns and partnering with local community foreign language media to give mental health information at the places immigrants visit frequently. Ponte (2019) stated that immigrants in the United States made tremendous contributions to this country, and their mental health “should be acknowledged, respected, and valued.” The immigrants in this content include Nigerian immigrant women.

African immigrants experience a higher rate of schizophrenia, a mental illness, and receive poorer treatment than Whites. Blacks identifying as African immigrants, including Nigerians,

have a higher rate of mental disorders like schizophrenia, and are more often diagnosed than Whites (McGuire & Miranda, 2008; Mental Health Disparities: African Americans, 2017).

However, “Mental Health Disparities: Diverse Populations” (2017) stated that 16.8% of Black Americans reported having a mental illness, compared to 19% of White Americans, but the consequences last longer on the blacks (Nigerian immigrants) as they receive a lower rate of treatment. 11% of Black Americans, including Nigerians, were not covered by health insurance compared to 7% of non-Hispanic White (Mental Health Disparities: African Americans, 2017). The minorities classified as Nigerian immigrants experience disparities in receiving quality mental health care access and use based on the provider’s discrimination, stereotype, and bias (McGuire & Miranda, 2008). Evidence by McGuire & Miranda (2008, Mental Health, Culture, Race and Ethnicity), states that “racial and ethnic minorities have less access to mental health services than do Whites, are less likely to receive needed care and are more likely to receive poor quality care when treated.” Conroy et al. (2021) reported that from 2008 through 2019, Whites have seen a significant increase in receiving mental health services (up from 16.1% to 19.8% compared with a move of 8.7% to 9.8% for Black or African Americans). Practitioners should remove disparities and implicit bias during treatment and treat Nigerian immigrants with dignity and respect, which could help to boost the number of immigrants seeking professional help.

Haynes et al. (2017) suggested that the strategies that can remove some of the barriers for these populations living in rural areas include “Conceptualizing mental illness as a normal reaction to stressful living environments. The use of community-based mental health services and providing mental health education to the public would improve the use of services in this population.” These ideas will give access to those in the rural areas who are more likely to be vulnerable to mental illness than those in the urban areas.

Culturally Competent Practice in Group Practice

To serve Nigerian immigrants efficiently and improve mental health care services and access, health care professionals should be culturally competent and aware of bias in assessing Nigerian immigrants with other racial groups. According to the National Alliance on Mental Illness (NAMI), a lack of cultural competence “results in misdiagnosis and inadequate treatment. Africans and other multicultural communities tend to receive poorer quality of care” (Said, 2018). Cultural knowledge and clinical skills are necessary for professionals to serve different races and ethnic groups based on their beliefs, identity, perception, and treatment intervention. Healthcare providers who are culturally competent help prevent discrimination against these immigrants. This leads to increasing diagnoses so that immigrants may receive proper treatment and care, which will improve their help-seeking (Said, 2018). Clinicians need to understand the Nigerian immigrant experiences brought into the States from their countries: the beliefs, attitudes, perceptions, and cultural values that may be clashing with those in the United States. Focusing on their perspectives and the environment is essential because it facilitates open communication, empathy, and identification (Said, 2018). According to Said (2018), “when the community can identify with the presenters and learn that they are familiar with their environment and culture, the

comfort level with discussing mental illness is increased, which leads to more information sharing and hopefully treatment and recovery.”

3. Conclusion

Seeking professional mental health care is a challenge among Nigerian immigrant women based on the barriers they face. However, there are strategies to promote and improve this population’s ability to seek professional mental health care and receive access to treatment. These are: creating and increasing awareness; improving education; creating inspiring programs; breaking stigmas, labels, and isolation; giving proper care and support to patients; creating policies that improve access to care; making the cost of treatment affordable; and improving the cultural competence of mental health professionals. These strategies would reduce misdiagnosis, reduce inadequate treatment, reduce poor and unequitable quality of care, remove public fear about group therapy, mitigate bias and discrimination, and help to eliminate distrust of mental health professionals. Lastly, creating community health centers to give mental health education to Nigerian immigrant women would change their beliefs, attitude, and perceptions about mental health illness.

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Critical Pedagogy and Critical Literacy in the Bilingual and ESL Classroom

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Abstract: The purpose of this paper is to examine critical pedagogy and critical literacy as it relates to bilingual and ESL education. First, we focus on Freire's (2018) ideas in the classroom and the extent to which they can effect change in the educational system. In brief, critical pedagogy in the classroom is a method of addressing social issues in which students evaluate their perspectives on injustice and authority. Next, we focus on critical literacy, which is based on Freire and Macedo's (1987) theoretical concepts and language and uses written texts to critique the social creation of knowledge. Finally, we give classroom activities for English Language Learners to develop critical pedagogy and critical literacy, which teachers can use to apply critical pedagogy to the classroom for the development of critical consciousness.

Keywords: critical pedagogy, critical literacy, teacher education, bilingual education, ESL education, critical consciousness

Introduction

Many educational stakeholders question whether or not education includes critical thinking (Schmaltz et al., 2017; Wright 2002). Those stakeholders—such as educators, government officials, and the public—have shaped the school system. Even though these stakeholders shaped the educational system, many minoritized voices are excluded. Current legislation such as Texas House Bill 3979 limits teachers' ability to teach students how to critically engage with politics through the explicit banning of political activism in the classroom. Because of the limitation on teachers' ability to teach and the exclusion of many minoritized voices, education can limit and oppress children's choices and voices. This paper discusses

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the connections between critical pedagogy and critical literacy by exploring its history, its correlation to English Language Learners (ELLs), and implications in the classroom.

Critical Literacy

While many educational stakeholders believe that critical thinking has all but disappeared (Schmatlz et al., 2017; Wright, 2002), critical literacy offers a way for students to critically analyze not only the words they read but also the world around them. Freire and Macedo (1987) called for critical literacy not only in regard to the word but also to the world. They problematized issues surrounding minoritized people, especially indigenous people from the global south. From here, they worked with those individuals to not only critique the ways in which words were used to perpetuate oppressive systems but also to notice what oppressive practices existed in their worlds. Critical literacy should be broader than just a critical understanding of text. It should also include critical practice to develop critical praxis. Critical praxis is reflexive action informed by theory and practice (Freire, 2018). Understanding oppressive systems within education is one thing, but taking action to change those systems is essential to understanding critical literacy. One of the ways that teachers of ELLs can be aware of these oppressive practices is to see how language practices can lead to the racialization of a person without any evidence of a linguistic or intellectual deficiency. Flores and Rosa (2015) understood this as a raciolinguistic ideology. Raciolinguistic ideologies are any set of beliefs that conflate language use and race. For example, some people may have an encounter with an individual who speaks broken English and—without even taking the time to hear their message—quickly make a judgment based on their language use and race. With many teachers being white and the traditionally minoritized student population increasing (Dozier et al., 2006), teachers should reject these ideologies and instead adopt heteroglossic ideologies to foster equitable language environments for their ELL students (Stewart et al., 2021).

While critically minded educators can help foster students to make the world a better place, some may view critical literacy as a detriment to society because it creates opportunities for erasing history. Freire and Macedo (1987) noted the differences in Nicaraguan and British schools in that the former taught that the way people view history has changed while the latter taught politics. Critical thinking is good until, for non-critically minded individuals, students question the official knowledge being taught instead of valorizing particular forms of knowledge.

For example, in the United States, many school districts are renaming their schools from confederate generals to more localized leaders that supported inclusive education (WFAA, 2017). Even though some school districts are taking the move to valorize more deserving individuals through school names, other school districts are backing down on those efforts due to some conservatives who call it cancel culture (Romo, 2021). Yet, even though many students want the schools renamed, regardless of how they prioritize this issue over others, school boards often will listen to adult constituents over students within school systems (Learning Network, 2021).

To engage students with critical literacy in the classroom, teachers must understand their students. Teachers are predominantly white, juxtaposed against the growing population of

minorities. This creates difficulties for both teachers and students. Students feel as if their teachers are either avoiding important topics and teachers feel as if they are not knowledgeable enough in the subject. When trying to implement critical literacy in the classroom, teachers should go beyond traditional texts and engage with their students' lived experiences. Culturally responsive teaching provides a foundation for teachers to not only engage with classroom materials in a critical way but also with their students' lived experiences (Gay, 2018).

While culturally responsive classrooms purposefully engage with students' lives, some teachers intentionally avoid communication with the parents (Dozier et al., 2006). To counter this, teachers can use surveys, which provide a way for teachers to create culturally responsive classrooms focused on critical literacy. While online surveys are easy to administer, many families continue to have difficulty accessing the internet or email (Vogels et al., 2020). Online surveys can include questions about their cultural background, traditions, interests, dislikes, and communication methods. Other ways to adopt a culturally responsive classroom embedded with critical literacy is to advocate for informal meetings with parents such as Donuts with Dads, Muffins with Moms, or the more inclusive, Pastries with Parents. These events invite families to come to the school and enjoy breakfast with their children while the children show their work. This is a shortened version of the more common Open House. Through surveys and family engagement events, teachers can enact a culturally responsive pedagogy to incorporate students' cultures and lived experiences into class topics and discussions.

Beyond the inclusion of students' cultures and lived experiences, teachers should also understand that they must care for their students. Noddings (2013) understood how education should practice an ethic of care in which teachers care for their students deeply so that the students will be ready to learn. Bartolomé (2008) extended Noddings (2013) work through the inclusion of a culturally responsive form of an ethic of care in *cariño*. *Cariño* moves beyond merely caring for a student and loving them but also noticing and working to dismantle the systemic inequities that students experience. Teachers with *cariño* must understand that their care for students should be expressed as an "armed love" (Freire, 1998), which focuses on giving students a liberatory education with high expectations.

This culturally responsive care goes beyond a Spanish-speaking population. Kim and Cho (2017) noticed how Korean children hardly question what is taught to them. The teachers in the study understood these cultural values and implemented read-alouds, which created a safe and comfortable atmosphere for students to share their viewpoints. Through this, students were able to explore multiple interpretations and develop critical perspectives. Creating a safe and comfortable environment for ELL students allows them to open up and become more comfortable while speaking.

Beyond speaking, critical literacy affords students the opportunity to engage their writing to enact social change (Hammond & Macken-Horarik, 1999; Luke & Freebody, 1997). Abednia (2015) suggests following a sequence for ELL students so that they can experience critical literacy regardless of their linguistic repertoires. Step one is to familiarize learners with critical literacy; step two is to negotiate the readings; step three is to ask critical questions; step four is to discuss questions collaboratively; and step 5 is writing reflective journals.

Throughout this process critical consciousness must be embedded. Critical consciousness is the process in which an individual sees the systemic issues in their world and works to change them for the good of people (Freire, 2018). Palmer and colleagues (2019) advocate for adopting critical consciousness, especially in the context of bilingual education. Critical consciousness or conscientization is central to critical pedagogy.

Critical Pedagogy

Critical pedagogy is a philosophy of education that invokes educators to encourage students to critique the oppressive power structures within education (Freire, 2018). Critical pedagogy takes place in the classroom, where the teacher highlights the importance of students forming their own opinions and positions. When students are able to critically analyze their world, they practice critical consciousness. When they take the ideas from their observations and do something about it, they enact praxis, the unity of theory and action. Freire based his theory on his struggles growing up in a third-world country and experiencing poverty. Some may question why Freire is used as the theoretical foundation to understanding critical pedagogy rather than other scholars such as Peter McLaren or Michael Apple. We believe that, because Freire's experiences with poverty and his cultural identity as Latin American reflect a large portion of children, his theories are uniquely situated to teach children, especially bi/multilingual children, through critical pedagogy.

Teachers can model praxis through the dialogical method to engage students with out-of-book activities, and problem-solving strategies (Uddin, 2019). Freire (2018) explained how true reflection can lead to action, which leads to activism. In order for students' voices to be shared they must have someone who trusts in their beliefs for reflection and also must have effort to start. Without trust, there are no connections and, most poignantly, no dialogue. These dialogical conversations create interactions among teachers, students and peers. These conversations are created through strong relationships with students in a safe environment where students are more likely to open up and feel comfortable sharing their opinions. Critical pedagogy is effective not only for general education but also for bilingual education (Darder, 2016).

For ELL students, applying critical pedagogy in the classroom is paramount to their educational success, especially in regard to critical consciousness. One option that the literature suggests is to give students critical thinking opportunities through problem solving and orderly thinking (Uddin, 2019). Students develop solutions and then analyze which solutions best fit the problem at hand. While this strategy does have opportunities for applying critical pedagogy, it mainly connects with critical thinking because it does not explicitly address solving a problem that students observe in their worlds.

Samuels (2018) connects the idea of critical thinking to critical literacy through culturally responsive pedagogy. Teachers of ELL students should relate students' culture to the classroom; when students are able to see themselves in the classroom, both student engagement and participation increase. When students are engaged, they can critically analyze texts through their cultural lens and contribute to deeper conversations about texts. However, even though applying a culturally responsive pedagogy through critical literacy can increase student engagement, students do not problematize issues that they observed in their worlds, or begin to read both the word and the world (Freire & Macedo, 1987).

Students can begin to read their world through out-of-book-activities (Uddin, 2019), starting with texts such as films, books, or music. They can extend their understanding of those texts through discussions. Discussions that happen in safe spaces with strong student-teacher relationships allow for students to develop their critical consciousness. They develop this by juxtaposing the text against their lived experiences.

The previous examples of applying critical thinking, critical literacy, and critical pedagogy to the ELL classroom come from the literature; however, there may still be a need for more specific activities for many teachers. The following section details some activities for a variety of grade levels from which teachers and students can apply a critical pedagogy.

Classroom Activities for ELLs to Develop Critical Pedagogy and Critical Literacy

Teachers serve as role models for students by providing scaffolding in the classroom. Teachers should maintain an open environment when dealing with selected critical readings and encourage students to discuss their opinions as they think critically. However, students, especially ELLs or bi/multilingual students, are frequently disrupted by a wave of nervousness or a sensation of loss inside the classroom (Cadiz-Gabejan, 2021). Teachers can help students in situations like this by presenting question strategies to use during selected readings and activities. These activities are meant to be suggestions for teachers who are in various stages of applying critical pedagogy in their classroom. Critical thinking, critical literacy, and critical pedagogy are modeled. We highly recommend that teachers look at who their students are and apply these strategies in a culturally responsive way that fits the needs of their students.

Critical Thinking: Asking Critical Questions with Math

To begin, many teachers hear the word ‘critical’ and immediately think about critical thinking. While the following section does not explicitly connect to critical literacy or critical pedagogy, we believe that it is a great segue into these challenging subjects. This should be the first step toward having students critically question their world and the word.

One way to apply critical thinking is to allow students to make better financial choices and be responsible through money. Sheila Bair's (2017) *Rock, Brock, and the Savings Shock* serves as a starting place where students can ask critical questions to determine comprehension. Each student can then create a storyboard along with a budget plan. During the interactive read-aloud, the teacher asks questions directly during the lesson to captivate students into thinking about the story such as “How did Brock feel when he got more money than Rock?” or “What did Brock do to help his brother in the end?” Additional potential guides for students to ask critical questions during or after the story are listed below (See Figure 1). This questioning strategy is important for bi/multilingual students because it serves as a scaffold for their comprehension of the story.

Because the story is about two twins, Rock and Brock, children can distinguish between the spender and the saver in the story. This gives students the opportunity to empathize with one of the characters. Students can demonstrate critical thinking through the creation of a budget plan. This allows them to see that, with limited resources, choices have to be made. Another application of critical thinking which could begin to foster dialogue in the class is a

group project, which asks students to decide what they would need to spend and save for a particular list of items (e.g. a robot, a car, a new game, food, or clothes) with a given amount of money. As a culminating activity, each group can give a short presentation to the entire class. Allowing children to critically think about limited resources is a beginning step for them to understand how these limited resources can be used for beneficial and detrimental reasons, especially for bi/multilingual students who are disproportionately from lower income families. This serves as a stepping stone to critical literacy.

Figure 1 *Critical Questions Menu*

<u>Bloom's Taxonomy</u>	<u>Top 6 Critical Questions</u>	<u>5 W's</u>
Creating • What would happen if..? Evaluating • Do you think it's a good idea or bad..? Analyzing • Can you distinguish between..? Applying • What can you change about the character? Understanding • Can you write in your own words..? Remembering • What happened after..?	What's happening? Why is it important? What don't I see? How do I know? Who is saying it? What if?	Who What When Where Why

Critical Literacy: Embracing Diversity and Social Justice in the Classroom

Students gain foundational knowledge in the elementary classroom. One piece of foundational knowledge that is necessary yet often excluded from curricula is social justice, which can be difficult to grasp. Students should engage with texts that help them understand the importance of fairness and justice in society. Critical literacy calls for this to be done through texts, and most importantly, through books.

Hood's (2016) *Ada's Violin: The Story of the Recycled Orchestra of Paraguay* (available in Spanish and English) gives great opportunities for students to critically reflect on the message of the book. In the book, a young girl named Ada lives in a dirty city called Cateura, Paraguay, where trash is being dumped near her home. Eventually, her passion for music unleashes her creativity, and she begins making instruments from trash. The book's theme is designed to help students understand the importance of having big ambitions in life, and it also defies stereotypes in vulnerable communities. Many bi/multilingual students come from Latin America and will empathize with Ada's experiences. These students need stories that serve as mirrors to their world while other students need these stories to serve as windows into new experiences.

Students can participate in critical discussions about the book guided by questions such as “Turn to your partner and ask what their favorite part of the story was. What is it about that section that appeals to them?” or “Think about Ada’s neighborhood. What were some of the issues that the children had to deal with?” Small group questioning is good for language development for bi/multilingual students because it gives them a safe place to practice their language skills. Additionally, if two bi/multilingual students are paired, they can practice translanguaging where they fluidly use their full linguistic repertoire (García et al., 2017). As a culminating activity, students can develop a multimodal presentation combining printed photos, biography, and Paraguayan culture to more deeply understand Ada’s world and her problems. Asking students to view Ada’s plight from a critical stance serves as a model of critical consciousness, which can then be applied to the students’ worlds, thereby moving students from a critical viewpoint to social justice through environmentalism.

Using Hood’s (2016) book can be a way to address diversity and social justice in the classroom; however, it is important that the stories we read with children serve as mirrors, windows, and sliding doors into their worlds (Bishop, 1990). These experiences are especially valuable for bi/multilingual children who are mainly Latinx (Braden & Rodriguez, 2016) and immigrants (Sotirovska & Kelley, 2020). Finding classroom materials that are both culturally responsive and embrace critical literacy can be difficult. The Anti-Defamation League (2021) provides many resources on a variety of reading levels and topics. Whether it’s about an immigrant girl achieving her American Dream, a Jewish family running away from the enemy, honoring friendships, or the meaning of respect inside a mosque, teachers should identify topics that engage students and their cultures. The previous examples are ways in which students can engage with texts; however, in order to truly practice a critical pedagogy, students must engage with both the word and their world.

Critical Pedagogy: Moving Beyond Classroom Walls

The previous examples were models of students applying critical skills in the classroom, yet they lacked the needed skill of asking students to think critically about their lived experiences and practice critical consciousness. Like Ada’s experiences in the previous story, many students see plastic pollution as an issue that affects the environment, and ocean wildlife. Seeing these issues not only as they affect wildlife but also the lives of individuals as seen in Ada’s *Violin: The Story of the Recycled Orchestra of Paraguay* can move students from merely being critical about a situation to enacting social justice. Students that understand the issue of plastic pollution can help other students develop background knowledge about plastics, its properties, and where it is recycled in the world. Students can more deeply interact with the student-created text through the use of virtual reality (VR) with Google Arts and Culture (GAC). The GAC app is designed for use in a highly interactive teaching and learning environment. The app only requires an electronic device and a Google Cardboard viewer. Then, with GAC’s exploration feature, students can use Ocean VR tours to provide context for learning and see the Great Pacific Garbage Patch. This type of activity is beneficial for the bi/multilingual student because it gives them a nonlinguistic scaffold to the learning, which can then be used to build their linguistic repertoire.

Students then can apply critical consciousness to the environmental problem through artistic citizenship, the creation of art for the good of others (Lozada, 2020). To do this, students will design an art activism sculpture out of plastics that showcases what they learned about plastic pollution in the ocean. These can include a lava lamp made of plastic water bottles, a jellyfish in a plastic bottle, or a plastic fish. Students can then produce an art show around Earth Day to bring their message to the community. These artistic expressions of the issue of plastic pollution allow students to artistically express the problem, like the Recycled Orchestra from Paraguay, and not only use their art for critiquing society but also to move from environmentalism to environmental justice as social justice. Lastly, students can write a personal reflection about how their art made a change for the better.

Extensions for Older Students: Environmental Awareness

Many of the preceding activities are geared toward elementary-aged students; however, critical pedagogy can be a powerful educational tool for older students as well. Continuing with the idea about the importance of environmental protection and the fragility of our ecosystem, the following activity provides a way for students to engage with critical pedagogy through environmental awareness.

This project allows students to examine the harmful environmental impact of everyday products. Students can investigate and collaborate with a partner to seek safer alternatives to certain products. Some examples of these products are disposable batteries, styrofoam, plastic water bottles, plastic bags, petroleum jelly, and re-refined motor oil. Students can investigate a product by focusing on either of the following questions: Is the product harmful? Can you list the product's ingredients? Once students understand the possible detrimental effects of the products, they can create a multimodal presentation that seeks alternative products, their benefits, and how to advocate to make policy change (See Figure 2). For bi/multilingual students, using multimodal presentations is a way for them to express their full linguistic repertoire because they might use images with multilingual content, create multilingual text, or even present in a multilingual fashion. These skills not only serve the bi/multilingual students but also create opportunities for all students to understand their worlds and create words to enact critical consciousness in regard to the topic at hand and the ways in which we use language.

Figure 2 *Multimodal Student Presentation*

Advocating Better Cleaner Energy

She attended Boston University and graduated with degrees in Economics and International Relations. Ocasio-Cortez represents one vision of the Democratic Party's future (Alter, 2019). She has proposed The Green New Deal which tackles climate change.

Alexandria Ocasio-Cortez's journey to Congress

- October 15, 1989: Alexandria Ocasio-Cortez is born in the Bronx, New York.
- December 2006: Stands for the Stuyvesant High School reorganization in North Dakota to protect the Dakota Access oil pipeline.
- May 2007: Officially votes off her primary card against the Democratic Party's future.
- April 20, 2018: The New York City Council of the Democratic Socialists of America endorses Ocasio-Cortez.
- June 25, 2018: Beats 21 others for 10 seats.
- November 6, 2018: Wins the general election with 70% of the vote, becoming the youngest woman ever elected to Congress.
- January 5, 2019: Is sworn in to Congress with the most diverse class in US history.

Savannah LedBusiness Insider, 2019

Alexandria Ocasio-Cortez is representing the 14th District of New York.

PART 1C CIVIC ENGAGEMENT

What is the Green New Deal?

The *Green New Deal* calls on the federal government to dramatically reduce greenhouse gas emissions, create high-paying jobs, ensure that clean air, clean water and healthy food are basic human rights, and end all forms of oppression.

The resolution does call on the federal government to make investments in policies and projects that would eventually change the way we design buildings, travel and eat.

For example: cows. To reduce methane, a powerful greenhouse gas that cows and other livestock emit, the resolution proposes "working collaboratively with farmers and ranchers in the United States to eliminate pollution and greenhouse gas emissions from the agricultural sector as much as is technologically feasible."

How?

To achieve those goals, the plan calls for the launch of a "10-year mobilization" to reduce carbon emissions in the United States. It envisions sourcing 100 percent of the country's electricity from renewable and zero-emissions power, digitizing the nation's power grid, upgrading every building in the country to be more energy-efficient, and overhauling the nation's transportation system by investing in electric vehicles and high-speed rail.

A GREEN NEW DEAL

PROGRESSIVE VISION • ENVIRONMENTAL SUSTAINABILITY • ECONOMIC STABILITY

"The Green New Deal Resolution is about more than just solar panels and wind turbines, it establishes the foundation for a successful and sustainable 21st century economy."¹

[Friedman, 2019]

local policy that supports sustainability

Clean Air Policy in DFW

Air pollution will be reduced through innovative energy efficiency strategies and implementation of low-emission and zero-emission technologies throughout the Board's operations.

When it comes to reducing our environmental impact, DFW International Airport is taking a balanced approach. By switching to renewable energy and implementing programs to use less of it, we have dramatically reduced our carbon footprint – and our energy costs (DFW, 2020).

The Airport indicated it also diverted 180,000 tons from landfills by recycling in 2018. DFW now buys 100 percent of its electricity from Texas wind farms (OET, 2019).

airport carbon accredited

NEUTRALITY

Conclusion

Critical thinking leads to an understanding of critical literacy and then finally critical pedagogy. The purpose of applying these ideas to education is to create independent thinkers. Independent thinkers allow for more ideas, leading to change, praxis, and activism. For the teachers to implement these strategies, they must focus on the students, lead the discussions, bring in topics about culture, and create a safe environment for them to feel comfortable. This is especially important for bi/multilingual students because the expressive possibilities of enacting a critical pedagogy allows them to not only develop content knowledge but also expand their linguistic repertoire. Making an effort to be culturally responsive, especially in a nation where the population of minorities is increasing, is vital for teachers. Having teachers be culturally responsive and implementing critical pedagogy in the classroom can result in more independent individuals just as Freire would have wanted.

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Examining Social Cognitive Theory and the Social Ecological Model in Reversing Predictors (Family Meals, Sleep, Media Use) of Childhood Weight Status Within the Home Environment

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Abstract

Although programs that focus on preventing and managing childhood overweight/obese status have been in place for some time and continue to be implemented, the prevalence of children who are overweight and obese keeps increasing. Research on protective and risk factors of childhood overweight/obese status continues to demonstrate the positive influence of family-based interventions on parents/caregivers and children. Such interventions represent some of the most viable strategies in managing childhood weight status. With a focus on predictors (family meals, sleep, and media use) within the home environment, this article reviews the applications of Social Cognitive Theory (SCT) and Social Ecological Model (SEM/EM) frameworks in preventing or reversing childhood overweight/obese status. Though these models have extensively been used in preventing or treating childhood overweight/obese status, differences in methodologies, design, sample sizes, measurement of outcomes, and duration of interventions limit generalization of findings.

Introduction

Epidemic prevalence of childhood overweight and obese status along with their immediate and long-term health consequences remains and continues to increase as documented by numerous research studies (Camp et al., 2017; Schuler & O'Reilly, 2017). SCT and SEM/EM are two frameworks that have extensively been used in preventing and treating childhood overweight/obese status. This article focuses on the use of SCT and SEM/EM within the home environment and reviews not only their effectiveness, but also reviews some of the

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challenges that researchers have identified while using the theories of behavior change. This article is part of a previously published dissertation on *Exploring Family Meals, Sleep, and Media Use as Predictors of Childhood Overweight and Obese Status in Oklahoma: A Study from the 2016 National Survey of Children's Health* (Umadjela Holmes, et al. 2020).

Information Source and Search Strategy

A search was conducted for articles published from 2014 to 2019, on the PubMed, CINAHL, SocINDEX, PsycINFO, Child Development and Adolescent Studies, Family and Society Studies Worldwide, and Academic Search Complete electronic databases. Reference lists of articles were also scanned to identify additional articles. Additional and newer articles were hand searched, using the Scopus electronic database. The basic key terms used to search for articles, in combination with the Boolean logic terms “AND” and “OR”, included social cognitive theory, social ecological model, ecological model, childhood obesity, overweight, prevention and control, risk factors, family, family meals, screen media use, digital media use, and sleep. The search was restricted to articles published in the English language that included participants between the ages of 6 and 18. Of 124 identified studies, 41 met the eligibility criteria. English language articles were included if they had (i) study participants between 6 and 18 years of age; (ii) a focus on preventing or treating childhood overweight or obese status without pharmacological strategies, and (iii) a focus on selected theories of behavior change (Social Cognitive Theory or Social Ecological Model).

Family Meals

Family meals influence current and future dietary behaviors in children. For instance, children tend to continue practicing eating behaviors acquired during childhood into adulthood (Caldwell, Terhorst, Skidmore, & Bendixen, 2018; Frederick, Snellman, & Putnam, 2014). Excessive consumption of high caloric foods is one of the key factors for weight gain; hence, children who are exposed to nutritious meals are more likely to consider such meals as part of their normal eating patterns and to carry their food preferences into adulthood (Caldwell et al., 2018; Rogers et al., 2017). In fact, children's consistent observation of their parents/caregivers' eating patterns leads to an increase or a decrease in the acceptance of foods that parents/caregivers eat or do not eat (Caldwell et al., 2018; Rogers et al., 2017). This complex process, known as the social modeling of eating, occurs when observation of other people's food choices and intake guides another person's choices (Cruwys, Bevelander, & Hermans, 2015; McGeown & Davis, 2017). Research demonstrates that having one or two family meals per week provides a protective effect during adolescence and adulthood as a result of behaviors acquired at a younger age (Berge et al., 2019; Jones, 2018). In fact, families that have frequent meals with their young children help establish behaviors that tend to continue even during adolescence (Berge et al., 2015; Loth et al., 2018).

Sleep

Shorter sleep is associated with many negative health outcomes, one of which is childhood obesity (Gohil & Hannon, 2018; Ogilvie & Patel, 2017). The presence and use of electronic entertainment and communication devices such as televisions, computers, tablets, video games, and cellphones during the hour before sleep, early school start times, academic workload, and caffeine consumption negatively affect the duration and quality of sleep in children (Dube, Khan, Loehr, Chu, & Veugeliers, 2017; Gohil & Hannon, 2018). Researchers

suggest that the use of media within an hour of sleep, stress related to school, and caffeine use tend to reduce the duration and quality of sleep in children (Dube, Khan, Loehr, Chu, & Veugelers, 2017; Gohil & Hannon, 2018; Reid Chassiakos, Radesky, Christakis, Moreno, & Cross, 2016).

Lack of sleep or insufficient sleep has been shown to increase both adult and childhood obesity risk due to changes in hormones that regulate hunger (ghrelin) and satiety (leptin) (Hart et al., 2017; Ogilvie & Patel, 2017). Since parents and caregivers play critical roles in modeling healthy lifestyles, interventions that support efforts to change the environment by restricting exposure to or usage of electronic devices, through enhancing parent-child interactions, can positively affect the amount and quality of sleep (Reid Chassiakos et al., 2016).

Media Use

Increased use of screen media by children has been associated with a higher incidence of childhood obesity, depression, the risk of developing hypertension, insulin resistance, high cholesterol, high inflammation, metabolic syndrome, and a risk for adult obesity (Lee, Kubik, & Fulkerson, 2018; Robinson et al., 2017). While this might be alarming, studies also reveal that interventions that seek to reduce the time spent using screen media positively affect behaviors and weight outcomes in children (Reid Chassiaskos et al., 2016).

The mechanisms that explain the association between increased media use and weight gain include reduced time for physical activities, increased intake of energy-dense foods/beverages during media exposure, reduced intake of fruits and vegetables, and reduced sleep (Tanskey et al., 2018). In addition to that, exposure to food advertisement increases the consumption of food and beverages (Lee et al., 2018; Robinson et al., 2017). Satiety cues become obscured as children become distracted while watching screen media (Lee et al., 2018; Robinson et al., 2017).

Social Cognitive Theory

Initially referred to as social learning theory (SLT) to explain the process of learning as a function imitation (Edberg, 2020; Sharma, 2017), SCT focuses on the impact of a person's attributes, behaviors, and the environment on health behavior change (Bandura, 1986; Rimer & Glanz, 2005). In SCT, behavior change occurs as a function of individual or internal characteristics and environmental or external factors, which summarize the key constructs of SCT (Edberg, 2020). Key constructs of the SCT that represent individual/internal characteristics include self-efficacy, behavioral capability, outcome expectations, outcome expectancies, self-control, and emotional coping (Bandura, 1986; Edberg, 2020). Those that represent environmental factors include vicarious learning, situation, reinforcement, and reciprocal determinism (Bandura, 1986; Edberg, 2020). Self-efficacy is a person's confidence in his/her ability to perform a behavior; behavioral capability includes a person's knowledge and skills to perform a behavior; outcome expectations reflect the likelihood and value of performing the behavior; self-control or self-regulation is a person's ability to control, to set goals, and to plan a behavior (Bandura, 1986; Edberg, 2020; Rimer & Glanz, 2005; Sharma, 2017). Vicarious learning or observational learning occurs as a result of one's observation of other people's behaviors; situation or environment includes the physical or social

circumstances or conditions around a person; reinforcement reflects positive or negative responses to a person's behavior, and reciprocal determinism is the influence of a person to and by the environment (Bandura, 1986; Edberg, 2020; Rimer & Glanz, 2005; Sharma, 2017).

Advantages of using SCT in youth-related food and nutrition interventions include the use of positive reinforcement and the ease with which SCT key constructs relate to real life situations (Greer, Davis, Sandolo, Gaudet, & Castrogivanni, 2018). Also, SCT can easily be applied in different settings and incorporates social and personal determinants in influencing behavior (Edberg, 2020; Greer et al., 2018). For example, youth-related food and nutrition interventions include the use of positive reinforcement, which is important to young people (Greer et al., 2018). Another advantage includes the ease with which SCT key constructs relate to real life situations, such as in farm-to-school programs (Berlin et al., 2013; Greer et al., 2018). Disadvantages of SCT include the complexity of its constructs, which limits its practical usage (Bandura, 1986; Edberg, 2020; Rimer & Glanz, 2005; Sharma, 2017). In their systematic review of the effectiveness of interventions that used SCT, Bagherniya et al. (2017) suggested weak evidence for the use of SCT in preventing or treating obesity in children. This is partly due to small sample sizes, not using all SCT constructs, shortened duration, and differences in educational content or methodologies during interventions. Despite those shortcomings, SCT has been applied in different health-related programs aimed at increasing confidence while performing a behavior, in predicting behavior, in modeling healthy behavior, etc. (Bandura, 1986; Edberg, 2020; Rimer & Glanz, 2005; Sharma, 2017). Taken together, these applications indicate that individual/internal characteristics and environmental/external factors that enhance and expose children to positive health behaviors impact weight-related outcomes in children.

Social Ecological Model

The Social ecological model, or ecological model, is a framework that explains how different factors at the individual, community, organizational, and societal levels intersect to influence personal choices such as food and physical activities (Bronfenbrenner, 1977, 1986; Edberg, 2020). Advantages of SEM/EM include the incorporation of different levels of influence on behaviors. Although SEM/EM is known to influence health behaviors at multiple levels, its complexity makes it difficult to explain the interaction of different variables in influencing behaviors (Edberg, 2020; Sallis, Owen, & Fisher, 2008). Additionally, the multilevel nature of the SEM/EM requires additional research skills which might slow down creativity or create unnecessary barriers in building partnerships (Wold & Mittlemark, 2018).

The use of SCT and SEM in childhood overweight/obese status prevention offers a foundation for creating broader initiatives to reduce childhood obesity by highlighting risk factors that seem to influence children's weight status.

Expanding on an ecological framework that emphasizes social and environmental changes at multiple levels, Wilson et al. (2017) reviewed the impact of evidence-based interventions that combined parental support, motivational and behavioral factors on weight loss of youth, especially those from underserved ethnic minority groups. In their study, they argued that positive parenting skills, autonomy support, and behavioral skill training influenced weight loss in children. Their findings are consistent with the growing number of studies that

demonstrate the impact of positive environments within the context of families, schools, communities, and healthcare settings on children's health-related behaviors.

Despite their central role in preventing childhood obesity, families are often left out in the planning phases of healthy living campaigns (Fiese & Bost, 2016). Fiese and Bost (2016) suggested the inclusion of families in the planning phases of healthy living campaigns by increasing families' partnerships with childcare settings, schools, parks, and other organizations that promote healthy lifestyles. While the aforementioned study applied a SEM/EM framework to identify factors that increased the risk of childhood overweight/obese status, another study, by Kellous, Sandalinas, Copin, and Simon (2014), tried to highlight unresolved issues of SEM/EM. The study evaluated to what extent integration of a SEM/EM approach into physical activity and sedentary behavior interventions has impacted their success on weight status (Kellous et al., 2014). Interestingly, the studies revealed the effectiveness of targeted physical activity determinants at different levels of the SEM/EM, including the social and organizational/built environment, in preventing obesity in youth (Kellous et al., 2014). Due to the wide variety of approaches used in interventions under review, Kellous et al. (2014) and Pratt et al. (2017) did not find conclusive outcomes about the specific components of interventions that were needed to achieve beneficial effects on obesity.

Summary

This paper focused on modifiable risk factors that are known to increase childhood overweight/obese status at the individual, behavioral and home environment levels. Family meals, sleep, and media use include behaviors that affect personal choices such as food/beverage consumption, (for example how much energy is consumed or expended) or the quality/quantity of sleep, which, in turn, are influenced by factors within a person's environment. As a relatively recent phenomenon, it is possible to reverse the increase in the number of children who are overweight and obese. SCT and SEM/EM have been extensively used in different interventions such as behavioral modification interventions. They both suggest that behavior can be influenced by individual and environmental factors. Compared to SCT, SEM/EM is more complex because it includes six levels of influence on behavior. Despite their disadvantages, SCT and SEM/EM have been successfully used in different settings. With that in mind, it is possible to adapt SCT and SEM/EM to different settings by focusing on their usefulness in changing behavior, by identifying outcomes that are influenced by specific constructs while recognizing the limitations of each.

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