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Roshad Bonner

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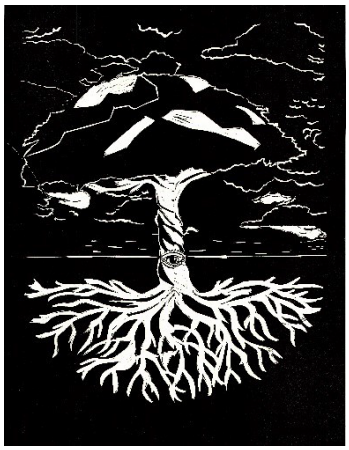
ABOUT THE COVER



Roshad Bonner is a graphic designer and printmaker from South Texas. Roshad recently graduated from TWU with a BFA in Graphic Design and also holds a BBA in accounting from Stephen F. Austin State University.

This piece, "Tree that Shades No One," was recently shown at TWU's East|West Galleries during the 2022 Fall BFA/MFA Exhibition.

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

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A Message from the Editors

This second issue in some way makes TWU Student Journal more *real* than the first. With the first, students demonstrated their ability to create scholarly works, and to work with reviewers and editors to make them ready for publication. Hopefully those students are set up to now get general responses from this scholarly community and beyond. But our second issue establishes that the journal is not just a one-off.

This issue is the product of more student contributors, increasing numbers of faculty advocates, and continuing administrative support. With Issue 2, we realize our ability, within TWU's *System with a Heart*, to keep going. We do so for what we see as a general good (the promotion of open access scholarship) and for the specific benefits it may bring to our student community; this journal is a living and growing laboratory for 21st Century academic publishing. We take on this yet small-scale effort so that TWU students may learn about open-access publishing, peer-review and publication life-cycles firsthand by doing those things within the bounds of a compassionate community. With confidence built by the process of incorporating the feedback of their peers and mentors, Pioneers become ready to submit to bigger journals at other institutions, and so move ahead with greater independence and a pioneering spirit in their own disciplines.

We need you, *student authors*. Without your lively explorations we cannot exist. Help us make it a living, diverse collation of voices! Here is an opportunity to speak out on subjects beyond your academic discipline, and to do so in a supportive environment. Our objective is to enable your voice, which means: we're here to help.

With our still early-days editorial team, the subjects we're comfortable reviewing are limited—we need you, *faculty champions, mentors and reviewers*! We would love to engage with faculty who can help us champion the TWU Student Journal as a supportive first experience in scholarly publication.

This journal has many kith, kin, elders, and allies at TWU. We are thankful to live in an ecosystem with other student publications, and are very thankful for the guidance and wisdom shared by those who have worked on *Ibid*, *Off the Quill*, and *The Lasso*. Speaking of *The Lasso*, we happily welcome Madeline Ray as a new member of the TWUSJ team. Working with us to brainstorm, copyedit, and create layout, Maddie's experience as *Lasso* Editor is invaluable to our collective efforts.

We wish you all a happy and productive 2023.

TWUSJ 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 a former 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, Manager of Digital Initiatives and Assessment, serves the TWU community with her involvement in the Texas Digital Library and the management of the university's institutional repository, the Repository@TWU.

Elizabeth Headrick, MLS, Digital Strategies and Innovation Specialist and TWU PhD Candidate in Rhetoric, is focused on Open Access and Open Educational Resources.

Kenneth (Woody) Evans, MLIS, is the Research and User Experience Manager at Blagg-Huey Library, as well as a PhD Student in Rhetoric.

Student Editor:

Maddie Ray, Maddie Ray is currently an undergraduate social work student and managing editor for The Lasso. She is passionate about equitable and inclusive university practices. Following graduation, she hopes to earn her MSW to work within the criminal justice system.

In this issue, our authors present work from various disciplines including visual arts, chemistry, and nursing.

Thank you to our wonderful student writers for their contributions!

TWUSJ Advisory Board

Fierce Solitude

Deyjah Stewart[1]

Abstract: The idea of solitude is usually known as nonsocial. However, solitude does not contradict social engagement but deepens it. Currently in progress for the Student Scholars Program, my creative project explores a reconceptualization of solitude connecting to themes of home and family, memory, childhood, and the self. By researching various historical and contemporary interpretations as foundational tools informing my work, I came back to the familial space of the house. Sewing and knitting nightgowns and slippers and then hanging them on a clothesline tell the story of my household's significant female figures-grandmother, mother, and daughter. I draw upon new experiences with solitude in this space with a knitted blanket where patches of sewn muslin signify the places I've lived and the beaded words narrate feelings of home.

Connecting to my Black Hispanic/ Latina and multicultural identity, I deepen my self-awareness and connection to the outside world by claiming my space in solitude.

Project Proposal

There is no sole definition of solitude. It is a cogent term in the public imagination, traditionally related to a profound experience. There is a long history of Indigenous and religious practice to retreat in the desert or mountains for solitary contemplation. Philosophers have generated various definitions, each leading to different questions. Aristotle described solitude as, "fit only for beasts or gods...and the idea of solitude where...the philosopher meditating alone in his study is a cliche of western culture (Koch 1990)." Today, solitude is expanding to encompass a broader range. Zoe Lescaze, the writer of the New York Times article, "An Artist Whose Muse Is Loneliness," writes about the contemporary South Korean artist Haegue Yang who compares solitude to humbleness, when asked about the difference between solitude and loneliness. Yang employs traditional solitary practices, such as deliberately alienating herself through constant travel, living alone, and keeping a few close friends. Her approach resonates with the French novelist, Marguerite Duras who once said, "One does not find solitude, one creates it." Ironically and paradoxically, her newfound success hinders her ability to maintain a sense of isolation,

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which so successfully fueled her art. Yang's art conceptualizes solitude and identity. In my project, I broaden these themes by exploring the connection with concepts of the self, home and family, memory and childhood, and sense of place. Thus, I redefine and re-conceptualize the subject of solitude and its relation to personal identity.

Often the idea of solitude is stigmatized as nonsocial. However, solitude does not contradict social engagement but deepens it, "...the self and other are in constant dialogue with each other." (Kanfo, 2012). Comparatively, cultural critic Philip Koch states, "... rich and emotional experiences of the outer world are possible in solitude." In Gaston Bachelard's book, The Poetics of Space, the house is used as a metaphor for human attachment to a space where memories and imagination are protected, housed, cultivated, and accessed. He explains that dreams, memories, imagination, childhood, etc., all exist through solitude where childhood plays a great role, "...it is certainly greater than reality...it is on the plane of the daydreams and it remains alive and poetically useful within us" (p.16).

Dorthe Nors, a Danish writer, is one of the few writers who claims her space in the subject. In an interview with publisher and editor Laura Macaulay, Nors spoke about her book Wild Swims. She articulates the purpose of using solitude as a theme in her writing:
"Solitude-and the ability to be with yourself ...to be open to the life that you carry with you is important to all people." Occupying various spaces (e.i.on a plane, hotel rooms, in the middle of a crowd), her characters hide within their inner selves where they reflect on their thoughts, ideas, moral shortcomings, fears, and memories. Nors's sensibility aligns with my project to explore responses to outside events through personal experiences and memories. Due to past experiences of feeling a lack of belonging, I often describe myself as someone who "lived in a room". It was through a sense of unbounded imagination that allowed me to share my personal experiences. Similar to Nors' characters, I hide within my inner self and contemplate the spaces and objects within the home (i.e. my bedroom, clothing, flowers, and knitting and sewing). In my project, I use materials reminiscent of home to create this type of imaginative 'fantastical' world, that grows from the need to understand my place in the world, integral to female Black Hispanic/Latina artistic identity. These materials primarily include sewing, knitting, and beading. My memories, thoughts, emotions, fears, and ideas are translated into various mixed media processes that expand my concepts in relation to solitude. My intention to produce a narrative beyond the "room" and explore this through an imaginative perspective, reflects my openness to share my experiences. Thus, I shift and expand the attitude towards solitude beyond the western ideology of isolation and loneliness towards a socially engaged concept existing within both self and relation to others.

Western thinkers have long defined what solitude should and could be: namely, a condition of being alone. However, I can attest, from personal experience, that there are other traditions where the meaning of solitude is much more complex. The "being alone" is only a small portion of what solitude has to offer. As an artist, I use solitude as subject matter in my work and as a mechanism to navigate my identity through my work. In my project, I will explore the richness of solitude provided in creating a practice to intentionally claim solitude

as a space of my own. My purpose is to deepen engagements and understandings of complex issues within personal experiences with consideration to culture and race.

Significant to this project are artists Tschabalala Self and María Magdalena Campos-Pons. They find their power in identity embedded in cultural history and memory that parallels their personal story of blackness and black spirituality. Maya Angelou utilizes solitude to guide her work by regularly renting a hotel room just for writing. While revisiting the question of identity, she reflects, "What I represent in fact, what I'm trying like hell to represent every time I go into that hotel room, is myself." She likens Nors's idea that we carry our experiences, "I believe that one carries the shadows, the dreams, the fears and dragons of home under one's skin, at the extreme corners of one's eyes and possibly in the gristle of the earlobe." Angelou is an empowering, poetic, and modern counterpart to Gaston Bachelard, her thoughts on identity, belonging, and growing up parallel my own and feed into a new perspective of solitude; we feel safest when we are inside ourselves, a place where we belong and the children inside are our real selves.

From her television series, Iyanla, Fix My Life, guided by her personal experiences, Iyanla Vanzant provides healing to families who are spiritually troubled. She often mentions that she uses her show as her "ministry"; to guide others to become their truest self through trust; in self, in faith, and people. A spiritual leader, writer, and educator, Vanzant specializes in reaching black audiences, addressing identity, self-awareness and acknowledging the past in order to heal, or "doing the work" as she infamously says. Both Maya Angelou and Iyanla Vanzant are quintessential contemporary women of color finding their identity and solidarity in solitude.

They are significant references for this project. Their teachings will drive my meditations on the subject of modern solitude and provide a metaphysical and conceptual backbone to the artmaking process.

The intent of this creative project is not to define solitude but to start a conversation, by giving a different perspective and exploring these possible concepts and their role in solitude. Through my research, I will develop my own original interpretation of solitude and its connection to identity. By using my personal experiences as a reference, my creative research will become a narrative where I use my identity as a member of the Black Hispanic/Latina community to break down stigmas around solitude and the communities' involvement.

Therefore, as an artist who thrives in and makes work about solitude, I am claiming my space and defining solitude in my own right to do right by my larger community. I see my work breaking away from the social and political limitations many artists of color confront and concentrating on new work that will extend and reflect an alternative form of identity art: to know one's self and embracing all that one finds there as a means of overcoming the confinements of colonial history. That is why solitude is important to me and is reflected in my work. As a Black Hispanic/Latina, multicultural artist in the 21st century, it is important to embrace and claim solitude as a gateway to a deeper cultural relation.

Project Statement

Fierce Solitude will embolden artistic identity and claim solitude by a Black Hispanic/Latina female artist. This creative project is important to the field of visual arts, as it creates and encourages deeper conversations about solitude that encompass contemporary spirituality, philosophy, identity, and empowerment. Redefining solitude provides new instantiations that go beyond the classical western definition and appropriation of the concept. I decolonize the concept of solitude and show the fierce positive force it can be.

Project Goals

The goal of this project is to define my role as a Black Hispanic/Latina and multicultural female artist and claim my space as an artist who thrives in and makes work about solitude. I strive to present a range of possibilities of what solitude can be in research and artmaking. As I apply personal experiences to define the essence of the relationship of solitude and creativity to art-making, I use a reflective practice to develop and produce artwork to understand how solitude is an act of being connected in space, environment, with self and others.

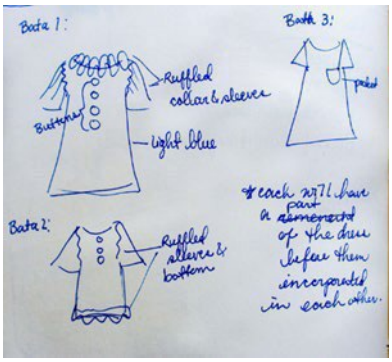
Introduction

My research and analysis relied on various historical and contemporary sources and interpretations about the meaning of solitude. I observed how philosophers have generated various definitions, beginning with Aristotle's description of solitude as "fit only for beasts or gods." Today, the idea of solitude where the intellect meditates alone is a cliche of western culture.

I was impressed to find some contemporary interpretations that began to separate from the traditional meaning. Clinical psychologist and psychoanalyst, Danielle Knafo ties solitude to relatedness stating that instead of understanding solitude as contradicting social engagement, it can deepen it. I mainly referenced the works of two writers Iyanla Vanzant and Dorthe Nors as a metaphysical and conceptual backbone to the art making process. I resonated with Nors, a Danish writer, who articulates solitude as the ability to be with yourself and to be open to the life that you carry. Iyanla Vanzant, creator of her television series, Iyanla, Fix My Life, guides others with her personal experiences and provides healing and awareness to families spiritually troubled. Vanzant is the main inspiration for the reconceptualization of solitude.

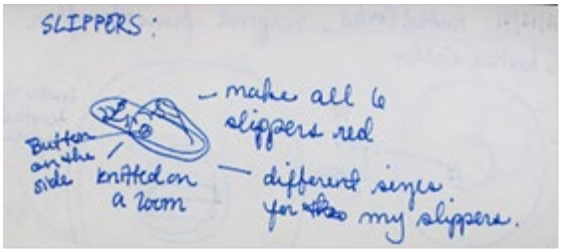
Through my findings and my own personal experiences, I identified several key concepts to begin developing ideas for each piece. Key concepts included: sense of place, home, family, childhood, imagination, memory, and self.

Batas and Slippers



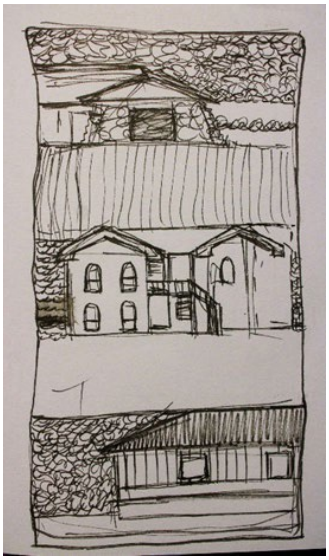
The batas became a narrative and representation of who I am within my familial community. La Bata is a Spanish term for dress/nightgown. I was reminded of my late grandmother who would use this term when I was little. Through a conversation with my mother, I understood the significant roles the women in my family played and how those roles were passed on to me. *"You are my mirror, just like I was for my mom."* This quote by my mother inspired the creation for this installation.

I purchased three corresponding colors of fabric to represent female figures; grandmother, mother, and daughter. I referenced a nightgown I already owned to determine the sizes of each gown, doubling the sizes that best matched my mother and grandmother. For the gowns, I gave each of them their own unique features while carrying some of these features into the next gown. This is to indicate that each woman carries the same trait as the one before For the slippers, I used a circular knitting loom for a faster process and red yarn. The red yarn reminded me of the hibiscus flowers my grandmother used to grow around the house as well as the feelings of warmth and comfort within the home.



House Hammock

My mother would tell me the story of how she learned how to knit, sew, and crochet at a program for young mothers. The baby blankets she made me, which I still keep, were the inspiration for the House Hammock. The idea of home and family largely shaped my personal identity and I found solitude within my tightly knit familial community.



For this piece, I worked with narrating the feelings of home by depicting three of the Florida homes I lived in as a child sewn into knitted blanket. I chose several skeins of multicolored yarn to create an abstract background that reminds me of my time in Florida. The blanket was also knitted on a circular knitting loom. For the homes, I sketched and cut out portions of each house and hand stitched them to the blanket with yarn that corresponded with each of the homes. I then cut out shapes to allow the background to show through. Letter beads were sewn through the empty spaces of the blanket. Words included *belonging, space, community, etc.* as they narrated feelings of home.

The final product was displayed as a hammock in the Fine Arts Building during the BFA Exhibition in May 2022.

Conclusion

Though this research is still ongoing, I have realized how my home and family life is heavily intertwined with the concept of solitude. I see that it is not just one idea but it in fact connects to many concepts, especially selfhood. The idea that experiences and connections of the outside world are possible to achieve in solitude. For myself, this was expressed in my inner, familial community.

Personally, solitude is a reflection of who I am, where I have been, and how I got here. These questions will guide me in my future work. Solitude can extend and reflect an alternative form of identity art: knowing who you are and embracing all that you find there outside of the political and social issues that many contemporary artists focus on. It is a possible connection to personal identity within the concepts of sense of place, home, family, childhood, imagination, memory, and self. Solitude is the ability to be with yourself, be open to the life you carry, and be aware of how one shows up in life and in the world.

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Applications of Chirality in Inorganic Nanomolecules

Alice McNeill [1]

Abstract: The term chiral describes two structures, such as molecules and nanoparticles, which are non-superimposable mirror images with sole symmetry operation *E*: 360-degree rotation about an axis. Chiral molecules are optically active enantiomers, meaning they rotate plane polarized light, and may be analyzed with circular dichroism (CD) instrumentation. Diastereomers include achiral compounds which differ in bond arrangement and do not superimpose on the mirror image, although may possess an internal line or plane of symmetry in addition to *E*. This review covers the introduction to inorganic chiral nanostructures, which are valuable in pharmacokinetics and chemical analysis methods. Chemical applications also include separation for enantiomeric selectivity, catalysis based on surface ligand characterization, and sensing chiral molecules from altered single-walled carbon nanotubes (*R*- or *L*-SWNTs).

Introduction

This review focuses on the chirality of individual inorganic nanoparticles as well as chiral nanoparticle assemblies of differing geometries and covers various nanomaterials in a comprehensive analysis. The types of chirality are defined with modeled examples, from chiral inorganic cores to achiral cores with chiral patterns of molecules on the stabilizer shell. The current and proposed applications are also explored, which include descriptions of chiral catalysis and biosensing. Chiral molecules may be classified as inorganic or organic, where chiral inorganic nanomolecules may consist of metals and have the potential for utilization in semiconductors, among other applications, and range in sizing from nanostructures to crystal structures. The synthesis of organic chiral nanoparticles, however, generally involves nucleation where the molecules coat the nanoparticle surface (Vekilov, 2010).

Chiral molecules are classified as non-superimposable, where two molecules side by side may be symmetrical across a central plane, but when superimposed, are not identical (*Figure 1*). In addition, chiral molecules do not have an operation of symmetry besides *E*: 360-degree rotation about a line axis. Chiral molecules include the classification enantiomers, which are mirror images that are non-superimposable. Diastereomers, in contrast, are non-mirror images which are non-superimposable, and are not chiral because they lack mirror image symmetry (*Figure 2*).

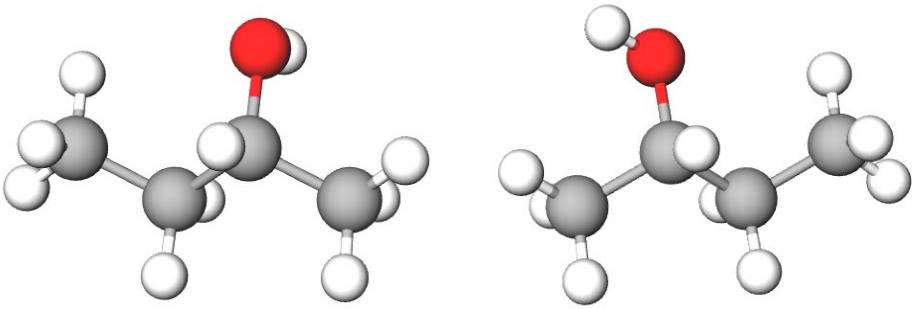

Figure 1: *Butan-2-ol ($CH_3CHOHCH_2CH_3$), commonly known as 2-butanol, is an example of a chiral compound (enantiomer) which exhibits mirror symmetry as (r)-2-butanol (left) and (s)-(+)-2-butanol (right) and is not superimposable; the sole symmetry operation is E (Solomons & Fryhle, 2011).*

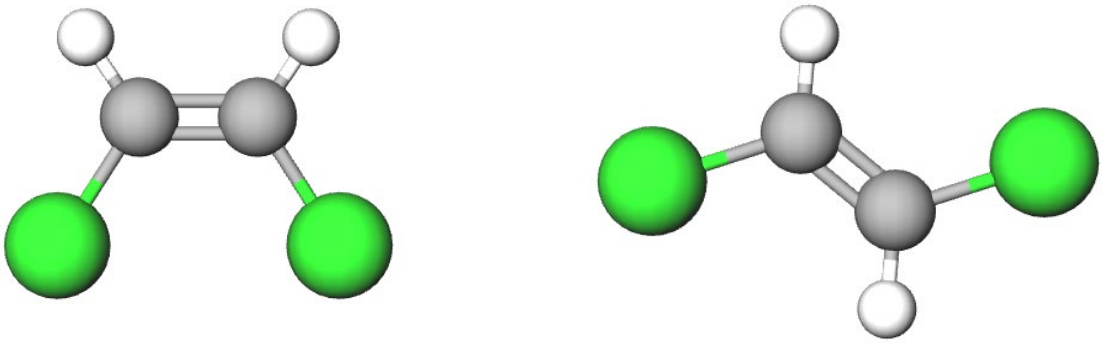

Figure 2: *Cis-1,2-Dichloroethene ($C_2H_2Cl_2$) (left) and Trans-1,2-Dichloroethene ($C_2H_2Cl_2$) (right) are diastereomers due to no mirror image symmetry and differing spatial arrangement (Solomons & Fryhle, 2011).*

Background

For nanoparticles to be chiral, there must be a homochiral biomolecule such as an amino acid or lipid to act as a surface ligand (Ma, Xu, de Moura, Wu, Kuang, Xu & Kotov, 2017). The chiral molecules attach either chemically with bonding, or physically with adsorbing like a film on the ligand. Chiral metal nanoparticles may be made with the aforementioned homochiral biomolecules; however, the difference lies in the chemical reactions which are performed to form the metal (Ma et al., 2017). These may include reduction of salts chemically, electrochemical reduction, thermal or photochemical decomposition of organometallic preceding chemicals, or laser ablation, and according to Ma et al., the most frequently observed method of synthesizing metallic nanoparticles was the chemical reduction method (2017). To improve the yield or better observe the structures, it is recommended to use the "separation techniques [of] chromatography, electrophoresis, and selective precipitation" (Ma et al., 2017).

Nanostructures are measured in nanometers, which should have at least one dimension that is less than 1×10^{-7} m in length, or about the size of a virus particle (CDC, 2022; Pradhan and Chakraverty, 2021). While found in nature, they are also engineered due to a valuable range of applications. These include, but are not limited to: drug delivery, gas storage, optics, cosmetics and electronics (Pradhan and Chakraverty, 2021). The structures vary from planar compounds, to nanotubes such as gallium nitride nanotubes which possess high electrical conductivity potential (Pradhan and Chakraverty, 2021).

To more efficiently examine the behavior and characteristics of chiral inorganic nanostructures, it is recommended to review isomerism. Isomers are two structures with the same chemical formula, which may differ in bond arrangement, spatial arrangement, or symmetry. The structures displayed in Figures 1 and 2 are examples of isomers. The main categories of isomers include configurational and constitutional isomers, both of which contain subcategories as expressed in Figure 3. Configurational isomers include diastereomers and enantiomers which differ in mirror symmetry, and both are non-superimposable. Constitutional isomers consist of coordination, ionization, hydrate and linkage isomers, which differ depending on which ligands are bound to the central ion or atom (Miessler. Fischer & Tarr, 2014).

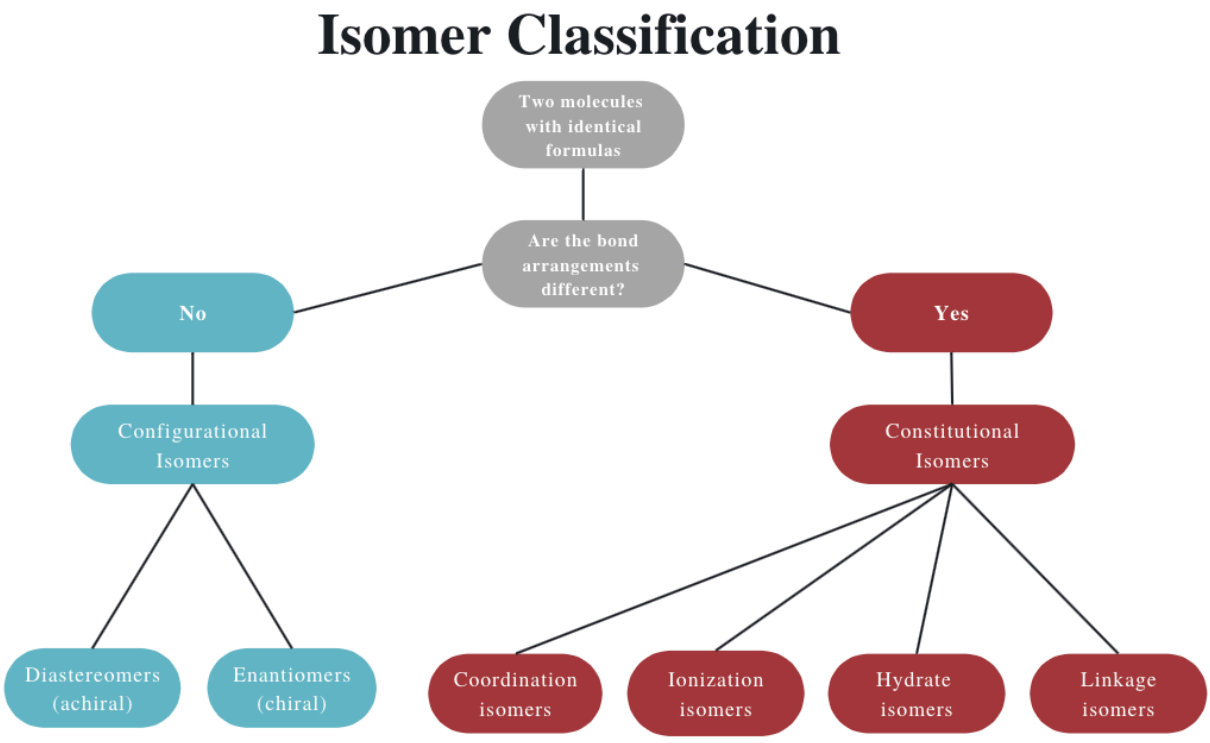

Figure 3: *Guide to classifying configurational and constitutional isomers. (Data from Miessler et al., 2014).*

Experimental Instrumentation

The instrumentation discussed by Ma et al. for investigation of chiral nanomolecules includes

Circular Dichroism (CD), Transmission Electron Microscope (TEM), Scanning Electron Microscope (SEM), Ultraviolet-visible spectroscopy (UV-Vis), and centrifuge. The CD utilization is for optical activity and UV-Vis for fluorescence analysis, as well as surface analysis in the case of SEM. SEM is valuable in measuring the surface of nanostructures as small as 50nm (Swapp, 2017). Modeling software in addition to computational analysis was also utilized. The CD is able to provide data about asymmetric structures such as chiral molecules, which do not possess an internal plane of symmetry.

Additionally, for separation of enantiomers, there are chiral HPLC columns available for utilization in research and commercial fields. This application may aid in entire separation of a racemic mixture, which is a solution composed of 1:1 enantiomers (Blackmond, 2019). A specific chiral HPLC column from Agilent may be utilized for separation and analysis of polar amines and additional separation applications for use in pharmaceutical research (2022) (Ali et al., 2022).

Results and Discussion

The optical activity of nanoparticles is discussed and displayed in various CD spectra in the review by Ma et al. (2017). The optical activity is where the plane of vibration is shifted after a plane polarized light is passed through an optically active liquid, and as compared to nonpolarized light, plane polarized light has an electric field that is only oscillating in one direction (Nafie, 2011). It was observed that chiral molecules result in optically active molecules (Nafie, 2011). This is due to their asymmetry and by utilizing vibrational infrared (IR) with CD, the absorption of the molecules may be analyzed (Andrews and Tretton, 2020). The geometry and arrangement of chiral molecules may be investigated with the use of CD in the infrared region due to the vibration of the structure (Nafie, 2011).

Ma et al. extensively covers the four types of chirality, the optical activity of chiral nanostructures, and various nanomaterials with applications, such as ZnO nanobelts for semiconductors (2017). Chirality types two through four as seen in figures 4B-4D are similar in that the inorganic core may be achiral, whereas type one chirality (figure 4A) requires that the inorganic core have a chiral geometry with only a symmetry operation of *E*. Types two through four also consider the surface ligands for classification yet type two requires the surface molecules to have a chiral geometry when bound to the nanoparticle. Type three is also unique in the sense that the surface molecules should be arranged in a chiral pattern, while type four focuses more on the asymmetric high polarization with consideration to the inorganic achiral core. Each of these types have unique applications and characterizations.

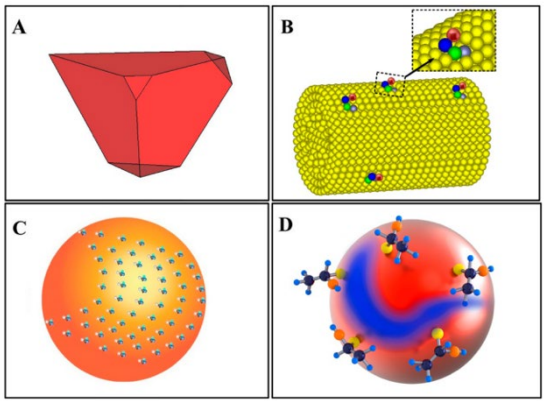

Figure 4: *From the review conducted by Ma et al., the significance of figures 4A-4D are described as followed (2017). (A) Type one chiral non-superimposable geometry based on an inorganic chiral core consisting of a potential inorganic crystal lattice without respect to surface ligands. (B) Type two chirality in which the surface molecules on the nanoparticle have chiral structure, with a potential inorganic achiral core. (C) Type three chirality consists of an achiral core with surface molecules arranged in a chiral pattern in the stabilizer surface ligand shell. (D) Type four chirality with a chiral field effect, consisting of an achiral inorganic core with high asymmetric polarization trends of achiral/chiral, chiral/achiral, and chiral/chiral ligand to adsorption patterns.*

The review by Ma et al. models the bonding and antibonding modes of branched nanorods (top), with sigma at a lower energy and sigma* at a higher energy molecular orbital, as seen in Figure 5 below, which also displays the scanning electron microscope (SEM) images for gold nanoparticles (2017). The SEM images are valuable for evaluating surface structure and texture. Figure 6 from Ma et al. contains the experimental and simulated CD spectra for CdSe and ZnS semiconductor nanorods in L- and D- formation with consideration to natural chiral distortion (2017).

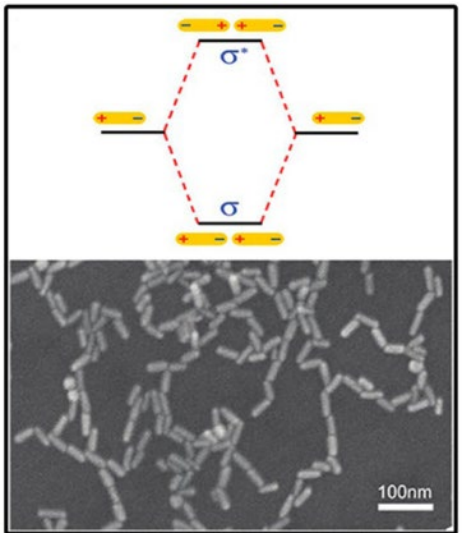

Figure 5: *The branched nanorods of gold (Au) are displayed via SEM, which are approximately 25nm in length each (Ma et al., 2017).*

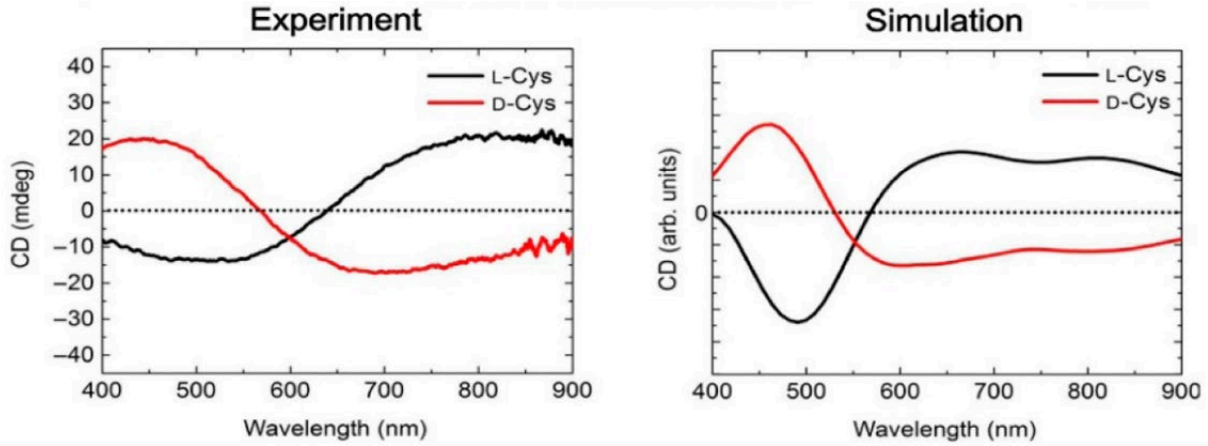

Figure 6: *Displays the CD spectra for the D- and L- Cysteine CdTe nanoparticles (Ma et al., 2017).*

Applications

The study of chiral molecules is valuable in that it connects topics for undergraduates and graduates in the courses of organic chemistry, inorganic chemistry, and instrumental analysis, while providing applications in real-world fields. The purpose of this review is to assist undergraduates and graduates in connecting the topics of chirality, which is typically introduced in organic chemistry courses, and nanostructures, which may be introduced in nanomaterials, inorganic, or instrumentation courses. These applications of chiral nanoparticles include "chiral catalysis, enantiospecific separation, biosensing, chiral memory, and chiroptical devices" (Ma et al., 2017, p. 8079). Chiral catalysis refers to nanoparticles that are utilized for accelerating reactions, where the surface ligands contribute most to the catalytic characteristic. The chiral surface ligands also contribute to the enantioselectivity which is important in pharmacokinetics such as "absorption, distribution, metabolism, and excretion" (Coelho, 2021, p. 2). For example, Iron-Palladium nanoparticles altered with chiral diphosphine ligands [(S)-BINAP] resulted in (S)-binaphthalene with a moderate yield of approximately 50% and enantioselectivity of 48% (Ma et al., 2017). This reaction was tested again without the (S)-BINAP modification, with no enantioselectivity observed (Ma et al., 2017).

In enantiospecific separation, Ma et al. has reported studies on gold and magnetic nanoparticles for efficiency. It was found that chiral gold nanoparticles altered with D- or L-cysteine are able to selectively adsorb one enantiomer from a solution, which leaves the ee remaining in the solution, where ee is the enantiomeric excess (Blackmond, 2019). For this separation, there should be a % major enantiomer – % minor enantiomer to determine the ee, however if the mixture is homochiral or optically pure, there will be 100% ee (Ma et al., 2017). Using a centrifuge is proposed to separate out gold nanoparticles that are modified with L-tyrosine (Ma et al., 2017). When considering magnetic chiral nanoparticles, the results are investigated using chromatography for separation based on the amount of relative solute (Ma et al., 2017). Enantiospecific separation is useful in the medicinal chemistry field for the synthesis of biological medications. Enantiomeric selectivity is the process of synthesizing a specific optically active chiral product, which is a valuable application to achieve desired structures, especially for the medical and electronic fields (Coelho et al., 2021).

In biological systems, there is also crucial chirality in amino acids, DNA, RNA, and polypeptides, the last of which is made up of repeating amino acid units (Blackmond, 2019). While amino acids are naturally left handed (L), the polypeptides they make up, along with DNA and RNA (sugars), are right handed (D) (Blackmond, 2019).

Conclusion

The study of chiral inorganic molecules aids in the bridging of knowledge between organic and inorganic chirality applications in real-world fields, in addition to analysis of nanoparticle behavior. Ma et al. predicts that the investigations on optically active chiral inorganic structures will continue to increase as maximal plane polarization rotation is sought. The applications have high potential and are vast; highlights include altering reactions with chiral catalysis, enantiospecific separation for medicinal chemistry, development of affordable optical instruments, and more efficient drug delivery in pharmacokinetics.

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Exploring the Role of a Joint Coach

Jana Haggard[1]

Abstract: Preoperative education for total joint replacement has been shown to have a positive impact on patients' anxiety, perception of pain during recovery, and improving post-operative quality of life. This project focused on the need to teach nursing students regarding protocols that begin preoperatively and continue until the patient's recovery goals are met.

TWU students were introduced to the role of a joint coach with a combination of didactic knowledge of standard preoperative care with an introduction to prehabilitation exercises to help students gain a deeper understanding of how healthcare collaborates to improve patient outcomes. Pre and post educational surveys were conducted.

Results showed a statistically significant improvement of the students understanding of perioperative care for joint patients as well as a better understanding of interdisciplinary collaboration.

This project highlights the need to incorporate educational modules for nursing students as well as creating joint coaching positions to provide care specific to this population.

Introduction

Nursing today includes many different roles. There are nurses who never treat patients, nurses who specialize in critical-care areas, nurse educators, advanced practice nurses, etc. Joint coaching is one of the lesser-known roles associated with the profession. Exploring this role and establishing its footprint in healthcare is something hospital systems and private practices should consider in order to optimize patient care moving forward.

A joint coach is a combination of educator, nurse, physical therapist, motivator, and social worker. Joint coaches oversee the patient from the moment the surgery is scheduled until recovery benchmarks have been obtained. They assist patients with learning prehab exercises, taking pain medication properly, understanding physical therapy expectations, increasing mobility, obtaining referrals, and acting as a hospital liaison if needed. Primarily,

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joint coaches are there to motivate patients and prepare them to have an active recovery so they heal properly and improve their quality of life.

Definition of Terms

Key terms used throughout the project that may be unfamiliar to readers include prehabilitation, or prehab; total knee arthroplasty, or TKA; unilateral knee arthroplasty, or UNI; rehabilitation; and joint coach.

Prehabilitation

Prehabilitation is the period of preparation prior to undergoing joint replacements. Patients are started on basic exercises in the weeks leading up to surgery to help build muscle but also to introduce patients to activities they need to do after surgery to improve and maintain joint function.

Total knee and Unilateral knee arthroplasty

Total knee arthroplasty and unilateral knee arthroplasty (UNI) are both considered joint replacements. The TKA is defined as full replacement of the joint—distal femur and proximal tibia diseased bones are removed, and artificial implants replace that part of the anatomy. The unilateral knee replacement, or partial knee replacement, utilizes artificial components to reshape only medial or lateral diseased bone. This project uses TKA to identify both procedures because preparation and recovery are the same.

Rehabilitation

Rehabilitation is any physical therapy that occurs after surgery has taken place. Patients either attend outpatient therapy or have in-home therapy. Every surgeon has a specific protocol they select, and every patient has a different preference. The decision is determined based on patient desire and their at-home support system. Rehabilitation often begins post-op day one or two.

Literature Review

Total joint arthroplasty procedures for knee and hip joints are among the most common surgeries performed in the United States annually, according to a statistical brief compiled by the Healthcare Cost and Utilization Project (2019). Total knee replacements are the second most common surgery performed behind cesarean sections. Knee replacements numbered 715,000—which includes primary TKAs, UNIs, and revision knees—in 2018, according to The American Joint Replacement Registry. The registry also reported that 602,582 total hip procedures were performed, with those numbers inclusive of primary and revision total hip arthroplasties (THA), hemiarthroplasties, partial hip replacements for hip fractures, and hip resurfacing. The data reported was collected from 2012-2018 and published in 2020. The report includes only surgeries by practices that subscribe to the registry; therefore, actual numbers are presumably higher.

Giardina et al. (2020) noted that joint-specific education provides patients a more realistic idea of what to expect after surgery but found there was no statistically significant difference between groups in terms of levels of experiencing nervousness or feeling prepared for surgery. There were 49 study participants, and 28 participated in joint education. Increasing study participants and measuring infection rate, improvements in mobility, and readiness to discharge from the facility may provide relevant data that reflects the positive impact of preoperative joint education on this patient population.

Survey results regarding preoperative joint education among orthopedic nurses who were interviewed about preoperative education concluded joint education was significant to patient outcomes but identified barriers to completing the education (Causey-Upton, 2020). The study, which involved 10 participants, lists barriers that include evidence-based practice changes to orthopedic protocols, timing, and length of education sessions.

A randomized control trial for total joint patients showed preoperative education by a multidisciplinary team—nurse educator, social worker, and physical therapist—was impactful in reducing postoperative inpatient physical therapy visits for the intervention group, which achieved readiness to discharge sooner; 1.2-1.9 days versus 2.7 days (Soeters et al., 2018). All 126 participants underwent a joint class. The control group had no other education. The intervention group received prehab consisting of exercises to begin preoperatively, exercises for the immediate postoperative period, fall precautions, bed mobility, and ambulation expectations.

Preoperative education for total joint replacement has been shown to have a positive impact on patients' anxiety, perception of pain during recovery, and postoperative quality of life (Edwards et al., 2017). Exposing nursing students to the role of a joint coach increased their awareness of the role, as well as demonstrated collaboration among different disciplines in healthcare and how teamwork leads to better patient outcomes.

Methodology

My educational project focused on teaching students protocols specific to total-joint patients that begin preoperatively and continue until the patient's recovery goals are met. The topic was selected because it is a relatively new role in nursing and students would benefit from the knowledge presented. Senior nursing students who are enrolled in their last semester of a nursing program were given a pretest that was inclusive of generalized nursing knowledge related to surgical knee replacement patients. They were then exposed to a short interactive lecture during which they were presented with content specific to joint replacement patients.

A slide presentation was prepared to highlight the role of a joint coach. Objectives were included to inform students of the knowledge they should gain from the brief presentation. The presentation was delivered during a regular class period's Zoom session. Via the chat

window, students submitted appropriate questions regarding the role of a joint coach, and questions were answered as they were presented.

Students were engaged in the content, as they had never heard of a joint coach. Slides were organized from pre-operative preparation to post-operative recovery so students could understand the larger picture of how to prepare patients for TKA and how healthcare employs a team approach with this population of patients.

Prehab exercises were emphasized so students would understand preparations for an active recovery process. Medications specific to the patient population were presented, and other non-pharmacologic methods to minimize opioid use during the immediate post-operative phase of recovery were discussed.

Results

A posttest was then administered to students. Results showed a statistically significant improvement in the students' understanding of perioperative care for joint patients as well as a better understanding of interdisciplinary collaboration. There were 106 responses to the pretest. The median was 55%. The lowest score was 34%, and the highest score was 80%. The posttest was provided to students immediately after the presentation. There were 93 responses recorded. The class period ended at the close of the presentation, and since no course grade would be recorded, some students may have opted not to complete the posttest. Data following outlines the results and measures the quality of the presentation based on the number of correct responses. The highest overall score was 96%. The lowest score was 10%. The median score was 78%.

Conclusion

Students presented many generalized questions about the role of a joint coach. Some had family members who had undergone joint replacements, but none of the students had heard of a joint coach. Exploring this role and increasing awareness of how a joint coach can impact recovery for patients will help improve outcomes and support the patient population—which is predicted to double by 2060, according to the U.S. Census Bureau (Vespa et al., 2020). Future research aligned with patient outcomes would be necessary to more comprehensively measure the effectiveness of the joint coach's role.

Targeted education specific to joint patients will benefit facilities and patients by increasing patient understanding of the surgical and recovery process. This education will also decrease postoperative complication rates because patients will be more informed and thus more likely to comply with instructions for before and after surgery. Therefore, hospital systems will reduce expenditures otherwise directed toward addressing complications. This cost savings would be enough to support the full-time role of a joint coach at the facility. Additionally, with this position in place, patients will have a stronger support system after surgery, which would result in higher patient satisfaction scores.

Recommendations

Creating a certification process for a joint coach and including training specific to the role—physical therapy, emotional support, and outcome expectations—would be a priority. Also important would be conducting a cost analysis to demonstrate the need for healthcare facilities. Future research would be necessary to develop a tool to measure the success of having a joint coach. Research topics that study reduced anxiety and preparedness levels would be beneficial to support having a joint coach at a facility. Additionally, measuring reduced post-op complications would be necessary to support facilities maintaining a healthy joint-replacement program.

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Obstructive Sleep Apnea: Do Oral Appliances or Hypoglossal Nerve Stimulators Work?

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Abstract: Obstructive sleep apnea (OSA) is a pervasive problem that affects the adult population and it can lead to serious health complications. Continuous positive airway pressure (CPAP) is the gold standard for treating OSA, however, noncompliance and nonadherence to CPAP therapy continues to be a challenge. Oral mandibular devices (OMD) and hypoglossal nerve stimulation (HNS) are alternative therapies used in patients who cannot tolerate CPAP therapy. A comprehensive literature search was performed using reliable search engines using the PICO question and the results were analyzed. The benefits and deficiencies of the OMD and HNS were examined and identified. HNS seems to be a promising therapy for patients with moderate to severe sleep apnea who failed CPAP. However, HNS is an expensive invasive procedure with identified short-term benefits. However, long-term benefits and disadvantages are yet to be known.

Background and Clinical Significance

In the United States, obstructive sleep apnea (OSA) is estimated to affect approximately 2%–9% of the adult population (Suni, 2021). OSA occurs when the throat muscles intermittently relax and block the airway during sleep, lowering oxygen levels in the blood and building up carbon dioxide (Mayo Clinic Staff, n.d.). A sudden drop in blood oxygen levels can lead to cardiovascular complications such as hypertension and increase the strain on the cardiovascular system (Mayo Clinic Staff, n.d.). Although continuous positive airway pressure (CPAP) is the standard prescribed treatment, only a fraction of patients adhere to the long-term treatment (Costantino et al., 2020). An oral appliance and hypoglossal nerve stimulator are some of the other devices used in OSA patients who have difficulty accepting and adhering to their treatments; however, their efficacy is not yet clearly understood.

Problem Statement

Different treatment modalities like surgical and mechanical devices are used in the treatment of OSA; however, nonadherence to the treatment therapy places the OSA patients at an increased cardiovascular risk. The utilization of oral appliance devices and HNS are alternatives considered in the treatment of OSA, and this paper explores the efficiency of these devices.

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Research Question

Does treatment of obstructive sleep apnea (OSA) with oral appliance devices or hypoglossal nerve stimulators in comparison to no intervention reduce adverse long-term cardiovascular outcomes?

Population: OSA patients
Intervention: Oral device and hypoglossal nerve stimulation
Comparison: OSA patients with no treatment or problem adhering to treatment
Outcome: Reduce cardiovascular outcomes

PICO is a format that aids in developing a clinical research question to facilitate the research.

Theoretical Model/Conceptual Framework

The Stetler model is one of the evidence-based practice models used to integrate the current research evidence into nursing clinical practice. The Stetler model utilizes the following five phases: (a) preparation, (b) validation, (c) comparative evaluation, (d) application, and (e) evaluation, which were applied to research findings to facilitate the evidence-based practice determination (McEwen & Willis, 2018). By using this model, it can provide a pathway to show how the research was executed and how it can be disseminated to the healthcare community.

For the preparation phase, a literature search was completed using Google Scholar, PubMed and CINAHL. The search was narrowed to the utilization of oral devices and hypoglossal nerve stimulation for the treatment of OSA and the cardiovascular outcomes post-treatment. The validation phase of the research includes choosing credible literature, reassessing fit for narrowed topic search, clinical significance, and level of evidence using the evidence-based medicine pyramid. The pyramid rates research studies from I-V based on the quality and validity of the evidence, with Level I being the strongest. The Cochrane level of evidence provides a Level 1 or high quality, reliable, and relevant strength of recommendation for healthcare interventions (Cochrane Collaboration, 2021). The Cochrane level of evidence is recognized internationally and used in aiding the best practice guidelines for primary care and patient decision making initiatives. Other articles were systematic reviews and meta-analyses with Level 1 evidence based on the evidence-based medicine pyramid; however, some cardiovascular effects articles were rated at a lower level because of limited research. In the comparative phase, literature analyses were performed and summarized into a literature review table (See Appendix). The strengths and the summary of findings were analyzed and taken into account, and an analysis of literature was done to find the conclusion.

The next phase was the application phase, in which the research results were actively disseminated into different methods of discourse like public seminars and posters, and then the practice change strategies would be applied. Last, an evaluation of the change and a cost-benefit analysis would be done to assess the credibility and outcome of the change.

Review of Literature

Search Strategy and Method

A comprehensive literature search was performed using Google Scholar, TWU library databases like CINAHL, PubMed using the keywords "obstructive sleep apnea and hypoglossal nerve stimulation," "hypoglossal nerve stimulation (HNS) and cardiovascular outcomes," and "oral devices for obstructive sleep apnea, and cardiovascular outcomes"; relevant articles were narrowed to interest. Google Scholar produced the most results with 7,620 results for OSA and HNS, which was narrowed by custom range period, hierarchy of evidence, and relevance to the PICO question. The inclusion criteria also included peer-reviewed and full-text articles. Similarly, OSA and oral devices were searched with custom range period and hierarchy of evidence. Finally, four peer reviewed full text articles were selected for HNS and HNS and cardiovascular outcomes; similarly, two articles were identified for the oral devices.

The first-line therapy for moderate to severe OSA is the use of CPAP, which acts as an upper airway stent to maintain an open airway during sleep; however, its use is limited by poor patient acceptance and challenges with long-term adherence (Woodson et al., 2014). Aslan et al. (2018) established that CPAP improves left ventricular ejection fraction and has beneficial effects on cardiovascular mortality rates. It is therefore imperative to find an alternative therapy for patients who fail the usage of CPAP therapy.

An oral device or mandibular advancement device (MAD) is an exclusive custom-fitted oral appliance used for patients who prefer an alternative treatment. Another therapeutic approach used is the hypoglossal nerve stimulation (HNS), which is a device that generates an electrical impulse through a generator that is then transmitted through a tunneled lead. The device is implanted in the upper right chest and ends with a cuff that delivers the stimulation to the hypoglossal nerve (Mashaqi et al., 2021). The hypoglossal nerve is involved in controlling the motor movement of the tongue, speech and swallowing (Cleveland Clinic, 2021). Once the device is implanted, the patient is given a remote to activate the therapy according to their need (Mashaqi et al., 2021).

Summary of article review

Costantino et al. (2020) evaluated long-term clinical outcomes and found that the HNS has shown to be a safe surgical procedure with a low rate of serious adverse events such as life-threatening illness or permanent impairment. This was a systematic review and meta-analysis of the three different types of HNS: (a) Inspire, (b) ImThera, and (c) Apnex. The results were acquired from the stimulation therapy for apnea reduction trial (STAR), which demonstrated that after 60 months, the adherence rate was 75% with an optimal objective and subjective benefit without long-term complications (Costantino et al., 2020). The study revealed that HNS is an excellent long-term treatment for moderate-severe OSA; however, cardiovascular outcomes were not studied.

Kompelli et al. (2019) assessed the effectiveness and safety of HNS for CPAP refractory OSA and established that HNS is a safe and effective treatment with high compliance, and it significantly improves the subjective and objective outcomes of sleep. The authors found minor complications and device malfunctions, although they were uncommon and benign.

The effects of HNS on heart rate variability as a measure of autonomic function was studied by Dedhia et al. (2019) in a single group cohort study. Dedhia et al. found that 12 months post-implantation of the HNS, a decrease was evident in heart rate variability (HRV) during sleep and less than 50% reduction in the apnea-hypopnea index (AHI) from baseline. These measures were similar to the compliant CPAP users.

Holfinger et al. (2021) reviewed multiple treatment modalities such as positive airway pressure (PAP), oral devices, neuromodulation like HNS, phrenic nerve stimulation (PNS), cardiac resynchronization therapy (CRT), and low flow oxygen therapy as well as using medications like acetazolamide and theophylline for sleep-disordered breathing in heart failure patients. Holfinger et al. found that all were effective in reducing AHI in central sleep apnea.

Sato and Nakajima (2020) studied the use of oral devices for OSA and found that long-term use of oral devices causes posterior open bite, and the nonadherence rate was high. They did not find any evidence of cardiovascular disease improvement. DeVries et al. (2018) did a similar study and found that while oral appliances were beneficial, no cardiovascular effects were apparent; however, the study was inconclusive.

Analysis of Literature

Even though oral devices are used for OSA, there is insufficient information regarding the efficacy of this device. The oral devices are easily obtainable and are not invasive. Sato and Nakajima (2020) found that the non-adherence rate was high among the users, and DeVries et al. (2018) did not find any cardiovascular benefits. Oral devices also have dental and skeletal side effects with long-term use. Consequently, the oral-device might not be a good choice for long-term therapy in OSA patients.

HNS appears to be an excellent long-term treatment for moderate-severe OSA. HNS is found to be safe and effective with minimal surgical complications. The subjective and objective outcomes of sleep study variables improved for HNS users. The reviews regarding cardiovascular outcomes for HNS remain to be studied, but more recent reviews show that the AHI and HRV index had an acute reduction from baseline in patients using HNS. The most indispensable fact about HNS is the high compliance rate seen among the users.

Nonetheless, more prospective studies comparing the various stimulation devices and cardiovascular outcomes with homogenous selection criteria using a longitudinal study will demonstrate that this therapy is reputable one. Also, most of the longitudinal studies are

fewer than 10 years; therefore, device malfunction, replacement complications, or long-term nerve or tissue damage was not discussed in the studies.

Conclusion

Obstructive sleep apnea is a prevalent condition that affects all age groups, especially older adults with comorbid cardiovascular diseases. CPAP is the standard treatment for OSA; however, patient tolerance and rates of adherence to the therapy remain low. This paper reviewed studies that investigated the effectiveness of oral mandibular devices and hypoglossal nerve stimulation therapy. The studies found that OMD and HNS help alleviate the symptoms of OSA in comparison to no intervention. The oral appliance might be beneficial, but long-term use of oral devices can cause posterior open bite, and there was no evidence of cardiovascular disease improvement. HNS was found to be safe and effective for moderate to severe OSA for patients who cannot tolerate CPAP and have not evidenced a long-term adherence rate. HNS is an invasive surgical procedure; however, complications from the procedure were benign and unremarkable. HNS was found to improve short term cardiovascular variables, albeit more research is needed. Although promising, prospective research studies need to be done to determine long-term cardiovascular outcomes and replacement complications.

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Appendix
Review of Literature Table

Summary of Primary Sources of Evidence

Citation of Evidence	Study Question or Hypothesis	Study Design	Sample/ Setting	Independent and Dependent Variables and Tools Used	Data Collection and Analysis	Findings	Recommendations/ Implications	Evidence Level
Costantino, A., Rinaldi, V., Moffa, A., Luccarelli, V., Bressi, F., Cassano, M., Casale, M., & Baptista, P. (2020). Hypoglossal nerve stimulation long-term clinical outcomes: A systematic review and meta- analysis. *Sleep and Breathing*, *24*(2), 399–411. https://doi.org/10.1007/s11325-019-01923-2	What are the long-term clinical outcomes of using HNS in the treatment of OSA?	System- atic review / Meta-analysis	350 patients from 12 studies	IV: pre-implementation, post-implementation, post- implementation of HNS (Inspire, ImThera, Apnex) DV: 6- and 12-month intervals Tools: A. Apnea-hypopnea index (AHI) B. Oxygen desaturation index (ODI) C. Epworth Sleepiness Scale (ESS) D. Pretreatment to post- implantation measures for meta-analysis E. RevMan v. 5.3 to calculate the magnitude of the treatment effect F. Cochran's Q method to assess heterogeneity G. Clinical measure reported as ±SD H. Statistical significance defined at	Adherence to therapy: Inspire = 70% ImThera = 35% Apnex = 60% adherence at 6 mos Inspire = 72% ImThera = 77% Apnex = 55% at 12 mos STAR trial: Overall long-term success. 18 mos = 64% 36 mos = 74% 60 mos = 75% Used 5.8 hrs /night A. Improvement in objective and subjective clinical outcomes. B. Elective surgery for patients who failed other therapies	HNS was shown to be a safe surgical procedure with a low rate of serious adverse events such as life-threatening illness, permanent impairment, or new or prolonged hospitalization with serious health impairment. HNS maintains an optimal objective and subjective improvement without long-term complications related to the device implanted.	Although further prospective studies with longer follow- up and comparing various stimulation systems should be performed, these findings reveal that HNS is an excellent long-term treatment for moderate-severe OSA.	Cochrane I

				$p < 0.05$				

Note. Three HGNS devices were tested in clinical trials. The Apnex Medical Inc. (St. Paul, MN, USA) device was promising in a phase II trial, but failed at phase III because it did not meet efficacy standards and the company no longer exists. The second device is the ImThera Aura 6000 (San Diego, CA, USA). It places six electrodes around the trunk of the hypoglossal nerve. It is still in phase III clinical trial. The third device, which is the only one approved by the FDA, is Inspire Medical Systems (Maple Grove, MN, USA) (Mashaqi et al., 2021).

Citation of Evidence	**Study Question or Hypothesis**	**Study Design**	**Sample/ Setting**	**Independent and Dependent Variables and Tools Used**	**Data Collection and Analysis**	**Findings**	**Recommendations/ Implications**	**Evidence Level**

Kompelli, A. R., Ni, J. S., Nguyen, S. A., Lentsch, E. J., Neskey, D. M., & Meyer, T. A. (2019). The outcomes of hypoglossal nerve stimulation in the management of OSA: A systematic review and meta- analysis. *World Journal of Otorhinolaryngology—Head and Neck Surgery, 5*, 41–48. https://doi.org/10.1016/j.wjorl.2018.04.006	Is HNS a safe and effective treatment for CPAP refractory OSA?	System- atic review and Meta-analysis	16 studies 381 patients	IV: Pre- and post-implantation of HNS DV: AHI, ODI, ESS Tools: PubMed, SCOPUS, Cochrane library.	Systematic review of 16 eligible articles; MedCalc 17.9.7 lists proportions with 95% CI; Fixed effects model and random effects model used; Heterogeneity I^2 = 64%, p < 0.00001; meta-analysis using RevMan v.5.3 with fixed and random effects models.	Across all trials, patients that receive HNS have significantly improved AHI, ODI, and FOSQ at 6 and 12 months. Patients experienced pain, tongue abrasion with or without lesions, and some device malfunction. Other adverse effects included abnormal sensations, paresthesia, change in salivary flow, and lip weakness. HNS is safe and effective treatment for CPAP refractory OSA. It is associated	CPAP is still first-line OSA treatment; however, poor compliance and improper use call for the HNS alternative. Difficulties with compliance with CPAP may warrant HNS use as compliance was reported to be 86% at 12 months compared to 40%–60% with CPAP. Long-termfollow-up needed.	I PubMED

						with high		
Citation of Evidence	**Study Question or Hypothesis**	**Study Design**	**Sample/ Setting**	**Independent and Dependent Variables and Tools Used**	**Data Collection and Analysis**	**Findings**	**Recommendations/ Implications**	**Evidence Level**

						compliance and significantly improves subjective and objective outcomes of sleep. Complications are uncommon and benign.		
Holfinger, S., Chan, L., & Donald, R. (2021). All you need is sleep: The effects of sleep apnea and treatment benefits in the heart failure patient. *Current Heart Failure Reports, 18*(3), 144–152. https://doi.org/10.1007/s11897-021-00506-1	Does treatment for sleep disordered breathing improve the survival rates of patients with heart failure?	Review of current guide-lines.	Review of multiple treatment modalities for CSA or OSA given in current guidelines.	IV: ESS and AHI. DV: Heart failure patients who have OSA and CSA.	CPAP: first line treatment for CSA. BPAP improved AHI, LVEF, mitral regurgitation. Oral devices may reduce AHI, ODI, and sleep r/t sx- limited studies. Lateral sleep position might be more beneficial.	Neuromodulation: HNS reduced AHI by 50%. Phrenic nerve stimulation: Transvenous unilateral stimulation of diaphragm with implanted pulse generator when activated, leads to contraction of the diaphragm, maintains normal breathing.	High clinical suspicion for sleep apnea should be maintained for heart failure. Adaptive servo ventilation (ASV) shows reduction in AHI in CSA, but with LVEF ≤ 45% is contraindicated. Neurostimulation, CRT improves CSA; targeted loop gain is showed to be	III PubMED

Citation of Evidence	Study Question or Hypothesis	Study Design	Sample/ Setting	Independent and Dependent Variables and Tools Used	Data Collection and Analysis	Findings	Recommendations/ Implications	Evidence Level
						CRT reduced AHI by 16.9 events/hr. O_2: low flow nocturnal O_2 (NOXT) with 4LNC decreased AHI Acetazolamide: useful to treat periodic breathing and mild diuretic for metabolic alkalosis and for pt with CSA and LVEF ≤ 40%. Theophylline: lowers loop gain/stimulates breathing.	effective, but no long-term studies. More studies and reviews of studies needed.	
Dedhia, R. C., Shah, A. J., Bliwise, D. L., Quyyumi, A. A., Strollo, P. J., Li, Q., Da Poian, G., & Clifford, G. D. (2019). Hypoglossal nerve stimulation	What are the effects of HNS on heart rate variability (HRV), a	RCT; Single group cohort; a sub-study of the STAR	Academic and private practice centers in the U.S. and Europe. Subset of participants (n = 46) in	IV: HNS implanted patients DV: AHI, HRV and sleep stage.	At 12 mos post-surgery analyzed HRV with SD of R-R interval (SDNN), low-frequency power of R-R interval, high-frequency power of R-R interval.	Significant improvement from baseline to 12 mos in HRV for SDNN and low frequency	Prospective studies needed to examine HRV alterations during wake as well as other clinical sequelae, such as arrhythmia	11 PubMED

	measure							
Citation of Evidence	**Study Question or Hypothesis**	**Study Design**	**Sample/ Setting**	**Independent and Dependent Variables and Tools Used**	**Data Collection and Analysis**	**Findings**	**Recommendations/ Implications**	**Evidence Level**
and heart rate variability: Analysis of STAR trial responders. *Otolaryngology–Head and Neck Surgery, 160*(1), 165–171. https://doi.org/10.1177/0194599818800284	of autonomic function?	(Stimulation Therapy for Apnea Reduction) trial.	two groups: Therapy withdrawal or Therapy maintenance	Tools: Assessed effects of HNS at 12 mos using HRV on HF/LF.	Analysis by sleep with 5-min. sliding window epochs during baseline, 12 mos., and maintenance/ withdrawal period.	across all sleep stages. SDNN analysis: no change in wake period (mean ± SD: 0.042 ± 0.01 vs 0.077 ± 0.07, *P* = .19) Reduction in SDNN correlated to improvement in AHI (*r* = 0.39, *P* = .03). No changes in SDNN for therapy withdrawal group.	burden, before and after HNS implantation.	

Sato, K., & Nakajima, T. (2020). Review of systematic reviews on mandibular advancement oral appliance for obstructive sleep apnea: The importance of	Does mandibular oral appliance (OA) aid in the treatment of OSA?	Review of system- atic reviews	Sample: Clinic-based dentists; patients with OSA using either OAm or CPAP.	IV: OAm vs CPAP DV: AHI, ESS, quality of life (QOL) Comparison with another tx—mandibular advancement OA (OAm)	Baseline and 3 yrs. Compared OAm and CPAP use in 27 research articles and with 46 patients; however, most patients dropped out before the end of the 3-yr study.	● CPAP is superior to OA in improving OSA symptoms. ● Should survey the adherence to	More studies needed on the effectiveness of OAm vs CPAP. Clinic-based dentists can treat with OAm. Dental education should include sleep medicine, and a	I PubMED
Citation of Evidence	**Study Question or Hypothesis**	**Study Design**	**Sample/ Setting**	**Independent and Dependent Variables and Tools Used**	**Data Collection and Analysis**	**Findings**	**Recommendations/ Implications**	**Evidence Level**