*Common*Health

A Journal of the College of
Public Health at Temple University

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Editorial Board

About the Editorial Board

CommonHealth, a journal of the College of Public Health at Temple University, is a peer-reviewed, online-only, open access journal for rapid dissemination of high-quality research and scholarship related to all aspects of public health. The Editorial Board includes representatives from each of the College's departments, with emphasis on student participation and membership. This membership aligns with the CPH's mission to promote transdisciplinary collaboration and develop the next generation of leaders in research, scholarship, service, and innovation. Our Board recognizes the need for shared governance with students so that the administration of the journal can serve as a training opportunity as well.

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TABLE OF CONTENTS

INTRODUCTION TO THE ISSUE

NARRATIVE REVIEWS

OP-ED

INTRODCUTION TO THE ISSUE
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CommonHealth Student Member Highlight: Ann Marie Finley and Maura O'Fallon

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Introduction and Commentary

In the almost three years I've been with the CommonHealth journal, I have had the pleasure of working with several capable mentors who have helped me find my path at Temple. When I applied to be on the board, I expected to do my work, get it approved, see it published, and move on to the work for the next edition. People come and go, so when Ann Marie Finley and Maura O'Fallon were announced as the new student editors, I didn't think much of it. Although I didn't know it at the time I first started, these two women would help progress not only my experience at CommonHealth, but my path towards my career greatly. I am the only undergraduate student to serve on our board at this moment in time. As a STEM student, working toward my Bachelor's of Science in Health Information Management and my minor in Public Health, I have struggled to find other women to look up to and learn from.

I have studied in great depth the effect that lack of recognition within your field can have, especially on women. In recent years, we have been seeing a steady decline of women entering the STEM field, which can be attributed to various factors: lack of exposure, education, stereotypes, culture, and more. In science, there is a tendency to overlook people and their achievements, especially if it is comparatively like another person's work, which has almost manifested itself into a widely accepted culture. This all goes to show that for a very long time, men have been– and continue to be– praised for the credit their female counterparts should've received, proving the existence of gender discrimination within science. When you're 20 years old and working towards your degree, this is a hard truth to face. I have often thought of switching my major, just to avoid the known difficulties I will face in my future career—it is hard to find purpose in such a distinguished field overpowered by the male perspective. However, it is women like Ann Marie and Maura that give me faith that soon, science will take a turn for the better.

In working with these women, I have been shown that the undergraduate perspective holds value, and that you are never too young to innovate and offer creative solutions. Ann Marie and Maura have brought a new life to our journal, and in doing so, became role models for me. These two females are the living proof that science is in capable hands.

Before they leave our board and move on to bigger and better opportunities, I wanted the chance to interview them. I hope the following provides our readers with an inside look into our journal, and the relationship between these two women that CommonHealth has helped to foster.

Q&A With Our Co-Editors in Chief

Tell us a bit about yourself. What graduate program are you in, and what do you plan to do after graduating?

Finley: I am a doctoral student in the Department of Communication Sciences and Disorders, where I study the cognitive processes underlying differences in spoken versus written language production. After I graduate, I plan to explore opportunities for postdoctoral appointments to expand my skills in computational analyses for clinically relevant language sampling and measurement. I am a big believer in inter-professional collaboration and enjoy working with students, so I hope to end up in a long-term position that affords me the opportunity for both things as I conduct my research!

O'Fallon: I'm a third (going on fourth) year student in the communication sciences and disorders doctoral program. I work with Dr. Rebecca Alper in the Language, Literacy, and Learning Lab and am broadly interested in early language development for children with high risk for adverse language outcomes. After graduating I hope to find a faculty position where I can continue pursuing my research interests, ideally someplace where I would be able to collaborate with practicing speech-language pathologists or other stakeholders in my projects.

What is one piece of advice you'd like to share with fellow graduate students, or those thinking of going into a graduate program?

Finley: When you explore or interview with a program, you are assessing the program just as much as the program is assessing you. Finding the right fit is critical to your future professional success. I recommend asking not only about academic opportunities and support, such as conference funding and coursework options, but also that you inquire about other aspects of the program. For example – how often does the entire department get together for work-related or social events? How would the interviewer describe the collegiality and overall atmosphere of the department or college? Small details like these can often be overlooked, but I have found that asking these sorts of "soft" questions gives great insight into the overall quality and dynamics of a program or department. Finally, I cannot emphasize enough the value of speaking to current and former students about their experiences both "in the field" and during their time in your program of interest!

O'Fallon: To focus on the small steps and celebrate EVERY accomplishment or milestone. Thinking about the big picture can be daunting for me, so it helps to focus on one piece at a time. Whether it's finishing a draft of a manuscript, submitting a project proposal, turning in a class assignment, or even just sending that one email you've been putting off for weeks—celebrating these small steps helps me maintain momentum and stay positive.

What has your experience writing academic projects and papers been like? Did that experience help you in your position at CommonHealth?

Finley: After working both as a team lead and as a supporting team member, one of the most important lessons I have learned in designing projects and writing papers is the importance of clear communication. If you are the project coordinator or the first author on the paper, be sure that everyone's ideas are heard and that there is a clear path for next steps to move a project or paper along. As a supporting team member, be sure that you know what the expectations and deadlines are for your particular duties. Keeping a clear set of goals broken down into incremental steps is very helpful for me, both mentally and in allocating my time management! While it might involve sending an extra email every now and then to make sure everyone is on the same page, it is far better to clarify questions and ambiguities ahead of time rather than move forward with uncertainty. This has been very helpful for me over the past year as I worked with the *Common*Health editorial team and our reviewers and authors.

O'Fallon: That's tough. At this point, I'd say that my experience writing academic projects and papers has been humbling. Previously, I've struggled with receiving edits or feedback on my work. It would make me feel defensive or insecure. That has changed since starting my doctoral program and gaining more experience with academic publishing. Now, I understand that reviewer feedback not only strengthens a particular manuscript, but it also helps you improve your writing. I think that reframing my perspective on the peer review process, to see it as helpful and a chance to grow, has helped me not only in my own academic writing but also in working with authors in my position at CommonHealth.

What has been your favorite part of working with CommonHealth?

Finley: I have really enjoyed the opportunity to familiarize myself with the broader research community at Temple, both within and outside the College of Public Health. I find that it is all too easy to get wrapped up in highly specific research "worlds" focused on a specific field or sub-field. For me, that world is language and semantic processing. However, by working with *Common*Health*,* I have learned about so much exciting and important research happening right under my nose! Did you know that the College of Engineering published a paper on using facemasks to counter bioterrorism? Or that within a month of the spring 2020 COVID shutdown in Philadelphia, a team from the Department of Health and Rehabilitative Sciences collected, delivered, and studied the impact of a large donation of books, games, and iPads to patients hospitalized with COVID-19? Me neither – until I got involved with *Common*Health. I am so inspired by the grit and determination that shine through as I read through submitted manuscripts and work with reviewers and authors to refine and prepare submissions for publication. It has been a privilege to be involved on the editorial board and to work with my wonderful counterpart, Maura O'Fallon, faculty advisors Dr. Sarwer and Dr. Ibrahim, and managing editor Jacque Spitzer. They are the definition of a dream team!

O'Fallon: The people! Through my position at CommonHealth, I've had the opportunity to get to know so many amazing individuals within the College of Public Health...many of whom are outside of my department. From editorial board members, to reviewers, to authors, to podcast guests, I have really enjoyed my time getting to know so many amazing individuals.

Over the course of this yar, you two have led our board side by side. What quality in each other do you admire most?

Finley: Limiting me to just one favorite Maura quality is so difficult, it is almost unfair! In addition to being a kind and genuinely fun person to work with, Maura is one of the most meticulous and hard-working researchers I have ever met. She has had a steady publication record since her first year at Temple – and take it from me, that is no easy feat for a new PhD student working in a pandemic! I admire Maura for many reasons, but one of my favorites is the way that she balances her own workload with service to Temple and the broader Philadelphia community. While managing her NIH grant, taking classes, and attending conferences, Maura has somehow found the time to serve on the *Common*Health board, coordinate Coffee Talks, and volunteer her time at local charities every weekend. I sometimes struggle to find a balance among my own obligations, and Maura is my real-life inspiration as an early-career woman in science, dedicated to excellence in research and willing to put in the work to support others on their own research paths. Maura is a stellar all-around person, and I am looking forward to seeing the impact she makes on the world!

O'Fallon: I admire so many things about Ann Marie! She's the best. But, if I had to pick one quality, I admire more than any others, it would be that she's a big thinker. This was honestly my first impression of Ann Marie, when we met at new-student orientation back in 2019. She was describing her master's thesis, and I was just in awe of the scope of the project and how confidently she spoke about it. Since then, I've gotten to know Ann Marie more, and I've seen her talent for big-picture thinking shine in other ways. She has a clear vision for what she wants, and she goes for it. Combine that with her top-notch technical skills in project design, writing, and data analysis…and she's just a total rockstar. I am so happy that we've had this experience together and can't wait to see all the amazing things she does in her career.

If you could talk to the upcoming Editor(s), what would you say to them?

Finley: First, congratulations and welcome to the best editorial board on campus! Don't forget to have fun (the team makes it easy) and enjoy the learning experience. While some growing pains are to be expected as you transition into your new role, you are not alone. In addition to Drs. Sarwer and Ibrahim, Jacque, and your new co-Editor-in-Chief, you have an entire network of us "retired" board members that you can reach out to for advice and support. This applies not only to journal-specific items, but to your own research and career path. Time on the journal is not just a one-and-done commitment – it brings you into a network of like-minded, hardworking individuals that can expand your professional horizons during and beyond your time at Temple. I am so grateful I had this experience and excited to see where you take the journal next!

O'Fallon: To really sink your teeth in to the experience and take advantage of the opportunities that the position affords. Having the chance to gain this type of editorial experience at such an early stage in your training is a huge gift. Get to know the faculty editors (shout out to Drs. Ibrahim and Sarwer!) and other members of the editorial board. I have learned so much about publishing (and life as an academic) from my conversations with others and am so grateful for those experiences.

SYSTEMATIC REVIEW
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Pelvic Floor Therapy for Athletes with Urinary Incontinence: A Critically Appraised Topic

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Clinical Question: *Do pelvic floor exercises decrease the occurrence of urinary incontinence in female volleyball athletes?*

Clinical Bottom Line: There is limited, but consistent evidence that pelvic floor exercises are beneficial in decreasing urinary incontinence in volleyball athletes. It is important that a training protocol is developed by an interprofessional care team for high impact sport athletes to mitigate the occurrence of urinary incontinence in sport.

Keywords*: Female Athlete, Women's Health, Stress Incontinence, Pelvic Floor Therapy for Athletes with UI*

Introduction/Clinical Scenario

Urinary incontinence (UI) is the eighth most prevalent chronic medical condition among women, affecting 27.5%-45% of young and middle-aged women.[1-2] Women with UI often experience urine leakage and increased frequency of urination.[3] Multiple subtypes of UI exist, with the most common being stress, urgency, and mixed. Stress urinary incontinence (SUI) is 'the complaint of involuntary loss of urine on effort of physical exertion or on sneezing or coughing'.[4] Stress urinary incontinence is thought to be due to a hypermobility of the bladder and urethra and weakness within the urinary sphincter.[5] Muscles of the pelvic floor (e.g., levator ani) experience atrophy, which then prevents those muscles from properly supporting the bladder and urethra complex, leading to SUI.[5]

Two opposing theories address pelvic floor strength in female athletes: female athletes have strong pelvic floor muscles, preventing SUI and female athletes may overload and weaken the pelvic floor, causing SUI.[6] Nulliparous female athletes involved in high impact training have increased cross-sectional areas of the levator ani and increased width of the puborectalis muscles. This hypertrophy response is believed to be due to increased intra-abdominal pressure from sport participation.[7] Although these adaptations seem like they would protect against SUI, up to 80% of women experience SUI during physical activity.[8] This may be more pronounced in sports like volleyball, where jumping and landing is inherent.[9-10] Pelvic floor fatigue and decreases in pelvic floor muscle pressure production are thought to weaken the pelvic floor, contributing to SUI risk.[11] These changes may be intensified as the muscles fatigue because strenuous exercise can decrease the maximum contraction of the pelvic floor muscles.[12] Altered muscle activity could result in decreased abdominal pressure in athletes.[13] This is especially problematic, as jumping causes a rapid increase in abdominal pressure,[14] which the pelvic floor muscle may not be able to counteract, increasing the risk of SUI. Furthermore, female athletes are embarrassed about SUI, including concerns about urine leakage during activity[15] especially in sports with tight clothing, such as volleyball.[16] Female athletes with SUI may benefit from pelvic floor exercises, which are designed to increase the support provided by the pelvic floor muscles. [12,17] These therapeutic exercises, as well as patient education, can be used for treatment and management of SUI. This study aims to investigate current literature regarding the influence of pelvic floor exercises on urinary incontinence in female athletes.

Focused Clinical Questions

Do pelvic floor exercises decrease the occurrence of urinary incontinence in female volleyball athletes?

Search Strategy

A search of PubMed, Cochrane, and Google Scholar was conducted in June of 2021 using the following PIO (patient group, intervention, outcome) setup to generate a Boolean phrase. Boolean phrase: Pelvic floor therapy AND athletes, Pelvic Floor OR urinary incontinence AND athletes, stress incontinence AND athletes, Pelvic floor muscle training AND athletes, Pelvic floor AND physically active, Pelvic Floor therapy, Pelvic floor muscle training, Rehabilitation, Pelvic Muscle.

- Patient group: Female Athletes
- Intervention: Pelvic floor exercises
- Outcome: Decrease in urinary incontinence during sport

Inclusion criteria were:

- Studies performed in the past 10 years
- Studies on female athletes
- Studies that used pelvic floor exercises
- Studies published or available in English

Exclusion criteria were:
- Studies performed on males
- Studies using electrical biofeedback

Evidence Quality Assessment

Internal validity on the selected studies was assessed using the PEDro scale, as all were randomized control trials. The PEDro scale consists of 11 questions, where the first criterion influences external validity of the study and the response is not included in the reported score which has a maximum value of 10.[18]

Results of Research

In total our search yielded 1,470 records (six from PubMed, five from Cochrane, 1,460 from Google Scholar). A summary of search results can be seen in Figure 1. Each article included was performed in the last seven years and utilized experimental and control groups. The two articles included in Table 1 met all inclusion criteria and were selected for inclusion in this CAT. Both studies demonstrated improvements of SUI symptoms following a 3- and 4-month training intervention.[19-20]

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Figure 1 – Summary of search results

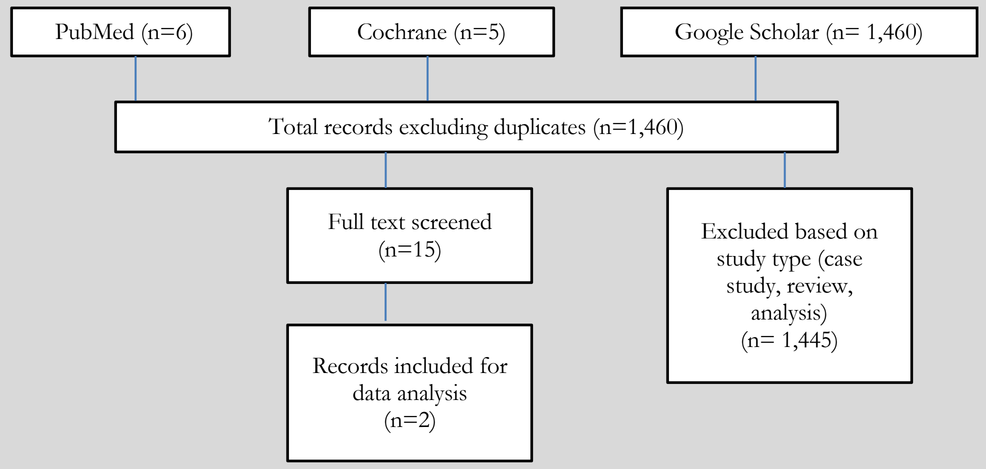

Table 1
Means and Standard Deviations

Article	N	Mean	SD	*p-value*	95% CI	Odds Ratio
Ferreira et al.	32	EG 2 CG 0.2	1.28 0.41	0.324	1.37-2.63 -0.001-0.401	.4545
Pires et al.	13	EG 1.29 CG 2	1.70 1.67	0.741 0.025	0.03-2.55 0.66-3.34	0.1500

- Data for Urinary incontinence included in the chart.
- *EG = experimental group; CG = control group*

Results of Evidence Assessment

The PEDro checklist was selected to assess the quality of evidence in both studies as an objective measure out of 10 criteria. Ferriera et al.[19] and Pires et al.[20] both scored a 9/10 only losing one point on investigator blinding.

Clinical Bottom Line

There is consistent supporting evidence that pelvic floor exercises are beneficial in decreasing urinary incontinence in volleyball athletes. Urinary leakage symptoms significantly improved in both studies following the intervention.[19-20] The non-invasive pelvic floor exercises were completed at home in both studies,[19-20] as well as part of training in Pires et al.[20] There was SUI in athletes who participated in these studies, [19-20] which is in support of Bo's theory that physical activity can overload and weaken the pelvic floor.[6] Healthcare providers should utilize pelvic floor exercise interventions for female volleyball athletes with SUI. These exercises should be administered and monitored by a health care provider trained in pelvic floor interventions. Additionally, by decreasing SUI symptoms, athlete concerns about leakage affecting performance may be alleviated.

Strength of Recommendation

Results from the included studies support the use of pelvic floor exercises to decrease urinary incontinence in female volleyball athletes. However, study type limits the strength of recommendation. We thereby assign a Strength of Recommendation Taxonomy rating of B.[21]

Implications for Practice, Education, and Future Research

The purpose of this CAT was to review the evidence to determine if pelvic floor exercises were effective in decreasing urinary incontinence in volleyball athletes. The evidence supports this question showing a significant decrease in incontinence when pelvic floor exercises are implemented.[19, 20] Based on the results of this CAT, pelvic floor education and strengthening are options for high impact athletes experiencing SUI symptoms. When working with an athletic female population, physicians and athletic trainers should recognize athlete concern of SUI and refer to physical therapists with expertise in pelvic floor therapy. Ferreira et al.[19] and Pires et al.[20] both found pelvic floor exercise significantly reduce urinary incontinence. Both studies evaluated the intervention via the Pad test, in which a sanitary pad is used to measure urinary output. The pad test showed a significant reduction in urinary output in the experimental group after following a pelvic floor muscle exercise program (Ferreria et al.[19]= -2 + 1.28, p <0.001, Pires et al.[20] = 1.43 + 1.27 g, p = 0.025). Ferreira et al[19]. used a 3 month long pelvic floor exercise program, consisting of exercises at home. Each day, the 16 participants were told to complete sustained and quick pelvic floor contractions in various positions. They performed 30 sustained contractions, and each was followed by 4 quick contractions. Pires et al.[20] used a 4-month long training program. The 7 participants progressed through a 2-week awareness and stabilization program, followed by 2-weeks of strength training. Both components were performed at home. Then, the participants started the 12-week power phase, which was incorporated into their volleyball practice. It should be noted that both studies reported no participant drop out from the treatment intervention when generally only 1/3 or fewer of patients complete a course of treatment. [22-23]

While both studies support the use of pelvic floor exercises to decrease SUI symptoms, more research is necessary. These studies only used a small sample of volleyball athletes. Future studies should incorporate participants from other high impact sports, such as gymnastics, ice skating and diving. Additionally, studies should examine if pelvic floor exercises can prevent developing SUI in elite athletes. Ferreria et al.[19] set inclusion criteria of current SUI symptoms, while Pires et al.[20] did not, although 71.4% met the criteria for SUI. Groups in both studies benefited immediately following the training intervention, but it is unknown if these exercises reduce the risk of SUI. Future research should consider if these exercises prevent SUI diagnoses, as well as determine when in the season training would be most beneficial to the athletes. Finally, more research is needed to see why there was higher patient compliance in these populations[19-20] compared to other populations.[22-23]

Many female athletes cite concerns about SUI during training,[9, 15, 24] with some even reporting a negative effect on social life and avoiding activities due to SUI symptoms.[24] Others report reliance on protective pads and restricting fluid consumption.[15] Healthcare providers for female athletes should be aware of SUI in this group and know that pelvic floor exercises may help athletes experiencing SUI symptoms. Recognition and intervention should be a collaborative, interprofessional effort. Physicians may diagnose SUI, but they refer out to other providers for treatment. Athletic trainers, often responsible for the day-to-day health care of athletes, are not trained in pelvic floor interventions. Physical therapists with specialization in pelvic floor therapy may be the best provider option to help these patients. All providers should work together to ensure the patient is getting the care they need to address SUI.

Table 2.
Characteristics of Included Studies

Characteristics	Ferreria et al.	Pires et al.
Study Title	Reeducation of pelvic floor muscles in volleyball athletes.	Pelvic floor muscle training in female athletes: A randomized controlled pilot study.
Study Participants	32 Participants. Mean age EG= 19.4, mean BMI= 22.8; Mean age control= 19.1, mean BMI= 21.5.	13 Participants.EG= 7 Mean age EG= 21.83, mean BMI = 21.75; Control= 6, Mean age control= 22.71, mean BMI= 21.37.
Inclusion/Exclusion criteria	Inclusion: nulliparous female volleyball athletes, symptoms of stress UI, age between 13 and 30 years, and amount of urinary leakage greater than 1 g. Exclusion criteria were treatment for less than six months, sport practice for less than two years, repeated urinary infections or at the time of sample selection, body mass index below 18 kg/m2 or above 25 kg/m2, and PFMRP adherence under 50%	Inclusion: 18 or older, elite female volleyball athletes, nulliparous, able to provide informed consent. Exclusion: inability to perform a correct pelvic floor muscle contraction or inability to insert or maintain the vaginal probe due to pain or discomfort, irregularity of sport performance, surgical treatment of gynecological and urological illnesses, UTI, and pelvic organ prolapse.
Characteristics (cont.)	Ferreria et al. (cont.)	Pires et al. (cont.)
Outcome Measures	Pad test.	Pad test.

Results	Urinary leakage decreased 45.5% in EG, 4.9% in CG; frequency in EG decreased 14.3%, in CG 0.05%.	Pad test EG initial =2.71, final= 1.29;
Evidence Quality Score	10/11(CASP)	10/11 (CASP)
Supports for the answer	yes	yes

CAT Kill Date: July 2027

CATS have a limited life and should be revised approximately 5 years after publication. (see https://doi.org/10.1123/ijatt.2018-0093).

Conflicts of Interest

None of the authors reported any conflicts of interest.

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Statement of Contributions

Dr. McMillen was the primary author and conducted the search and wrote and edited the paper. Drs Tierney, Russ, and Mansell contributed to the writing and editing of the final paper and its drafts.

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NARRATIVE REVIEW
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"Facing" the Repercussions of Sexual Harm: A Scoping Review on Neuroimaging Studies Using Emotional Stimuli with Survivors of Sexual Violence

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Sexual violence (SV) is a public health issue that affects millions of Americans. SV survivors can experience a variety of physical and psychological symptoms, particularly when exposed to stimuli that triggers challenging emotions. The brain may be a key area to better understand survivor reactions to emotional stimuli and symptoms associated. While some research has attempted to understand SV survivor neural responses to emotional stimuli, no review has aggregated findings across these studies. The purpose of this review was to synthesize research findings of studies that used neuroimaging techniques to explore SV survivor responses to emotional stimuli. Studies that were published in PubMed prior to October 2021 were identified using key search terms including phrases relating to "sexual violence," "neuroimaging," and "emotional stimuli." Our PubMed search yielded 87 studies, with 11 studies meeting the full text review criteria. In general, SV survivors displayed significantly heightened brain response patterns when exposed to emotional stimuli compared to non-SV survivors (e.g. temporal lobe all areas (n=8), amygdala activation (n=5), parietal lobe activation (n=4), frontal lobe activation (n=5)). SV appears to have some effect on emotional brain responses, which may explain behavioral differences in emotional reactivity. Additional exploration is needed, however, to understand future neural intervention targets to better support survivor health and recovery.

***Keywords**: Neuroimaging, Sexual Violence, Emotional Stimuli*

Introduction

Sexual violence (SV) is a significant public health issue that affects millions of women, and a small percentage of men, worldwide.[1-3] SV can include any type of non-consensual sexual activity including but not limited to in-person, online, or other forms of technology.[2] More than 1 in 3 women have experienced some form of SV, with 1 in 5 experiencing an attempted or completed rape in their lifetime.[1-2] In most SV cases, the victim or survivor (for the purpose of this review we will refer to these individuals as survivors) knows the perpetrator, with approximately 99% of these perpetrators being men.[1-3]

Impact of SV on Health

SV has a range of short and long term consequences and is related to a number of physical and psychological conditions.[1] Physical injuries may include bruising and genital injuring.[2] Experiencing trauma, like SV, can also be linked to physical health outcomes like obesity,[4-6] diabetes,[6-7] chronic pain,[6, 8-10] and gastrointestinal disorders.[6, 10, 11] Psychologically, SV is linked to post-traumatic stress disorder (PTSD), anxiety, depression, eating disorders, sleep disorders and suicide ideation.[2, 10, 12] For example, around 75-80% of survivors have PTSD after the occurrence and 41% have PTSD after one year.[13-14] In addition, approximately 13-15% of survivors are living with depression and 12-40% are living with anxiety.[14] Suicide ideation occurs in 23-44% of survivors and up to 20% have attempted suicide.[14]

SV survivors use more medical services than their peers and incur 12-43% more in overall healthcare costs compared to the general population.[12] The cost of rape alone can total upwards of $122,461 per victim which includes but is not limited to medical costs as well as loss of productivity and criminal justice system fees.[2, 12] However, only 5% of SV survivors report their SV history to their primary care providers, which may limit engagement in treatment and care.[12]

Understanding the Impact of SV on the Brain

The experience of SV is also believed to impact brain functioning, with the temporal lobe seeming to be most commonly affected. The temporal lobe has a variety of functions from processing auditory signals like speech, processing visual information to send to the occipital lobe, and retrieving memory for semantic knowledge of objects.[15] Within the temporal lobe, the amygdala has been commonly studied in survivors, as it is primarily responsible for stress responses and the processing of emotional information including emotional behavior and motivation.[16-17] Studies have found amygdala volume differences,[18-20] hippocampal volume differences[20] as well as white matter and gray matter abnormalities[21-22] in survivors of SV. The cognitive impacts of SV have also been associated with emotion regulation difficulties and lower educational attainment.[23-24, 25-27]

There are several different types of neuroimaging technologies that can be used to understand how SV impacts survivors at the level of the brain. Some examples include functional magnetic resonance imaging (fMRI), positron emission tomography (PET) scans, and functional near-infrared spectroscopy (fNIRS) devices. An fMRI works by detecting the changes in blood oxygenation and flow during neural activity to create detailed scans.[28-30] During a PET scan radioactive material is injected or inhaled to create an image that displays brain activity.[30] An fNIRS is a portable headband technology that assesses regional tissue oxygenation, primarily detecting frontal lobe activity. The downside of fNIRS is that it lacks spatial resolution which makes it not as detailed as an fMRI or PET scan.[31] While all of these technologies have benefits and drawbacks, studies using any of these types of technologies were included in this review of neuroimaging studies.

Impact of SV on Behavior

The experience of SV is also associated with a number of risk behaviors, including binge drinking, smoking, and high-risk sexual decision making.[23-24] Estimates range between 13-49% and 28-61% for SV survivors that develop alcohol use disorders and substance use disorders respectively.[13] For example, a study by Silva et al[32] revealed that undergraduates who experienced childhood SV used more tobacco products, marijuana, hypnotics, and sedatives compared to than their peers who had not experienced SV. These differences in behavior may be explained by the aforementioned impacts of SV on the brain.

The socialization of gender and sexuality may also play into the impact of SV on behavior, as one study found that women survivors of childhood SV are more likely to experience higher rates of binge drinking than their male counterparts with similar experiences.[33-34] In addition, for middle-school and high school youth, binge-drinking rates and surviving SV occurred at higher rates for LGBTQ+ women in comparison to their cisgender, heterosexual male peers.[35] Violence against women specifically has been linked to emotional dysregulation, avoidance, numbing, and dissociation.[36] This reveals the potential impact of emotional and cognitive processes on SV survivor wellbeing and functioning, as well as differences that may occur based on the way gender is reinforced in society.

Impact of SV on Emotional Reactivity

As mentioned previously, women who are SV survivors are twice as likely to develop PTSD than their peers,[37] which is associated with variations in the volume of different brain structures.[38] Even exposure to acute emotional stress on its own can increase spine synapse formation in the basolateral amygdala, leading to anxious and avoidant behaviors.[38] Continued exposure to emotional stressors, like SV, has a compounding effect on these symptoms and behaviors[38] and can lead to volumetric asymmetry (e.g., smaller left than right amygdala).[39] Volumetric asymmetry of the amygdala is related to many neurological disorders including anxiety and PTSD, which can manifest as agitation, irritability, hostility, hypervigilance, self-destructive behavior, or social isolation.[40] This illustrates just one example of how neural changes related to SV impact the reactions and behaviors of SV survivors.

Those who experience SV can experience a heightened startle response, even if they do not formally qualify as having PTSD.[41] For example, a study by Jovanovic and colleagues[42] measured startle responses in a sample of adults that experienced early life trauma, finding that those who reported high levels of physical or sexual abuse had an increased startle response compared to demographically similar control groups. Startle responses can be a biomarker for stress responsiveness that may follow survivors into adulthood. Other studies have found higher cortisol in those who have experienced SV or other types of gender-based harm, which could in turn impact emotional reactivity and behavior.[43]

Survivors of gender-based harm like SV experience challenges processing and identifying emotions compared to their peers.[44-46] For example, Young and Widom[46] found that those with a history of childhood maltreatment, including but not limited to SV, had less accuracy than their peers in recognizing positive and neutral images. Relatedly, Muñoz-Rivas et al[47] investigated the variability of emotional dysregulation among women who experienced different types of intimate partner violence, linking emotional dysregulation to lower levels of physical health and multiple episodes of intimate partner violence to greater psychopathology and poorer emotional regulation. In these studies, there is also some evidence to suggest that different types of trauma uniquely affect neural bases of emotional reactivity. Young and Widom[46] found individuals who experienced physical abuse during childhood indicated less accuracy for identifying "emotionally neutral" photos while those with a history of sexual abuse and neglect were less accurate in recognizing photos with a more "emotionally positive" theme. In addition, Muñoz-Rivas et al[47] found that when comparing PTSD symptoms in interpersonal violence to other survivors of trauma, those that experience interpersonal violence displayed more PTSD symptoms and related behaviors compared to their peers. Similarly, Jovanovic et al[42] found a difference in startle times for persons who reported greater physical or sexual abuse compared to those who had lower levels of abuse. This substantiates the need for this review to look at the impact of SV specifically, rather than generalizing to all forms of interpersonal or gender-based trauma.

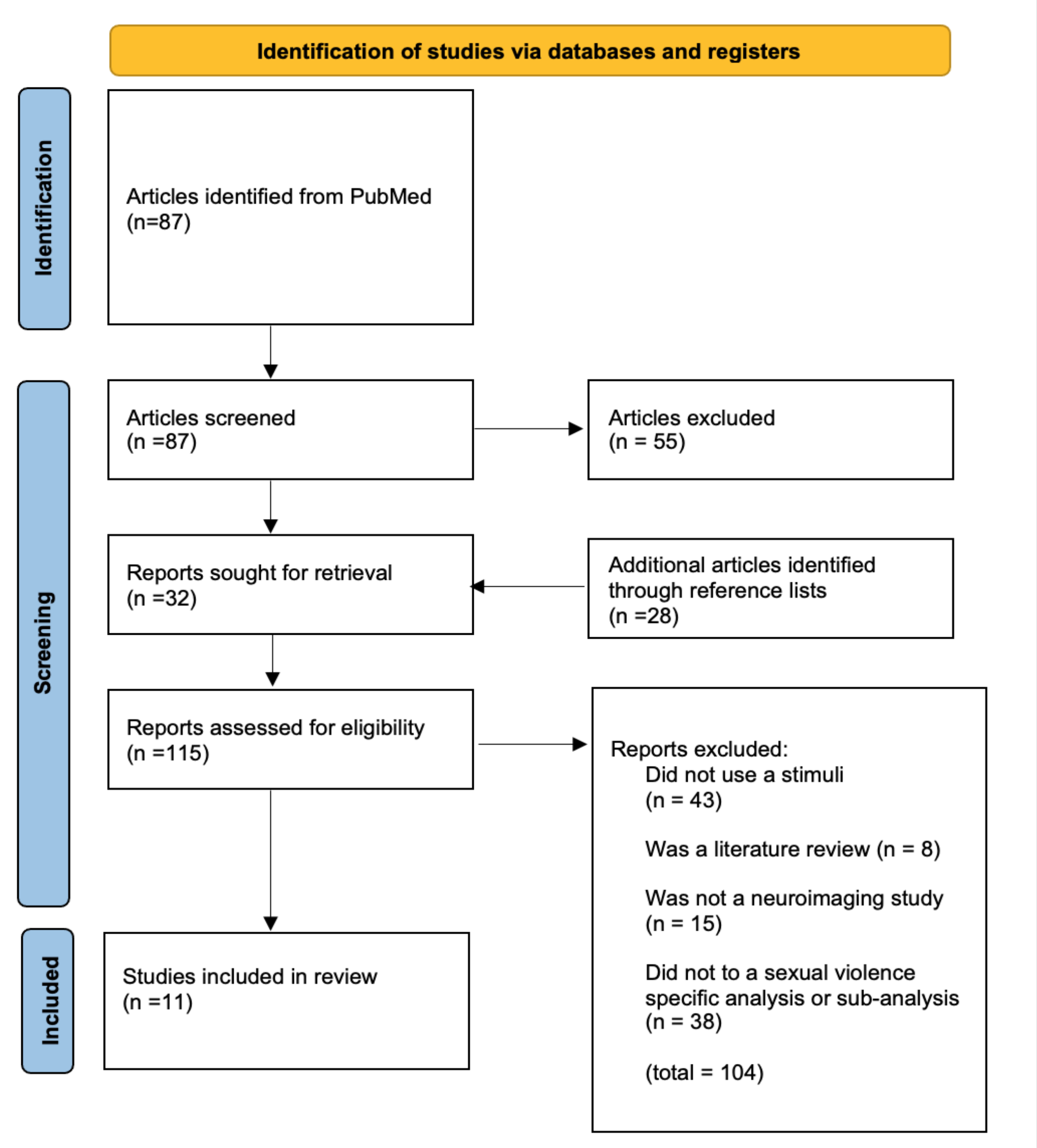
The Present Review

Given the need to better understand the links between SV exposure, the brain, emotional processing, and resulting behavior the present review seeks to aggregate articles that used neuroimaging techniques to explore SV survivor brain responses to emotional stimuli. A scoping review is ideal for beginning this endeavor, as scoping reviews serve to gather and examine the available evidence regarding emerging areas of science, such as neuroimaging with SV survivors.[48] This is a critical area of research, as understanding neural reactivity differences in survivors may lead to targeted interventions and additional brain exploration to create more multifaceted interventions designed to support the emotional and psychological health of survivors.

Methods

Our search was completed in October 2021. Studies published in PubMed before that date were identified using a search strategy created in collaboration with a library scientist. Key search terms included phrases relating to "sexual violence," "neuroimaging," and "emotional stimuli." See Appendix A for a detailed search. Studies were only included if they followed our aforementioned criteria, were empirical, and were written in English. Studies were excluded if they included samples of maltreatment or abuse generally and did not conduct SV-specific analyses. Our refined PubMed search yielded 87 studies. After reviewing titles and abstracts, 32 studies were included for full text review, with additional studies (n=28) added via selected studies reference lists. To screen the studies, one author reviewed all relevant abstracts and titles. Each study selected was then screened at the full-text level by the author and a senior author. The first and senior author made final decisions in collaboration on the included articles. Once final studies were selected, hand searching of their reference lists was done to identify any additional studies for inclusion that may have been missed. The end result yielded 11 studies (see Figure 1 for PRISMA diagram).

Figure 1: PRISMA Diagram



Inclusion Criteria

Participants. All races, genders, age groups, sexualities, and socioeconomic statuses were considered, given the global public health nature of this issue. All participants had to have had some type of sexual violence encounter in their lifetime.

Concept, Context, and Types of Studies. Sexual violence was operationalized as any non-consensual sexual harm that someone experienced. Key terms included, but were not limited to: sex offenses, sexual child abuse, sexual assault, rape, and adult survivors of child abuse. Emotional stimuli was operationalized as any sort of lab derived task intended to perpetuate frequent or intense emotional activity or arousal. Emotional stimuli included emotions, emotional correlates, cognition, emotion processing, and emotional faces. Lastly, the MeSH term "neuroimaging" included terms like fMRI, in addition to terms like fNIRS and PET scans. Only papers published in English were included.

Results

Eleven studies met the criteria after full text review. See Table 1 for a summary of the studies found. Ten of the 11 studies used an fMRI to measure brain responses, while Bremner et al[49] was the only study that used a PET scan. Five studies used facial stimuli.[50-54] Six studies used some other type of emotional stimuli.[49, 55-59] All studies were published between 2005-2019.

Table 1: Abbreviated Evidence Table of Articles Synthesized

Citation	Country	Emotion-related Tasks Used	Purpose/ Aims	Study Population	Type of Violence Experienced By Participants
Quidé, Y., Cléry, H., Andersson, F., Descriaud, C., Saint-Martin, P., Barantin, L., Gissot, V., Carrey Le Bas, M. P., Osterreicher, S., Dufour-Rainfray, D., Brizard, B., Ogielska, M., & El-Hage, W. (2018). Neurocognitive, emotional and neuroendocrine correlates of exposure to sexual assault in women. Journal of psychiatry & neuroscience : JPN, 43(5), 318–326. https://doi.org/10.1503/jpn.170116	France	**Facial stimuli & other tasks:** * emotional go/no-go task with face matching neutral, happy and sad facial expressions * N-Back working memory task with letters (1-back, 2-back, 3-back, 4-back) * Mental imagery task where participants were instructed to rest, or remember positive or negative memories.	This study investigated changes in cognition, emotional processing and brain function in the early stages after sexual assault.	Total (n=47), Female survivors of sexual assault within 4 weeks of the traumatic event (n=27), Age-matched controls (n=20), age range: 18-52, race/ethnicity: not specified	Sexual assault
van den Bulk, B. G., Somerville, L. H., van Hoof, M. J., van Lang, N. D., van der Wee, N. J., Crone, E. A., & Vermeiren, R. R. (2016). Amygdala habituation to emotional faces in adolescents with internalizing disorders, adolescents with childhood sexual abuse related PTSD and healthy adolescents. Developmental cognitive neuroscience, 21, 15–25. https://doi.org/10.1016/j.dcn.2016.08.002	Netherlands	**Facial stimuli:** Emotional face-processing task with fearful, neutral or happy faces of constrained conditions (""how afraid are you?"", ""how happy are you?"", and ""how wide is the nose?) and one unconstrained conditions passive viewing.	The current study examined habituation patterns of amygdala activity to emotional faces (fearful, happy and neutral) in adolescents with a DSM-IV depressive and/or anxiety disorder (N=25), adolescents with CSA-related PTSD (N=19) and healthy controls (N=26).	Total (n=71), Adolescents with a DSM-IV depressive and/or anxiety disorder (n=26), female (n=22), male (n=4),Adolescents with CSA-related PTSD (n=19), female (n=17), male (n=2), healthy controls (n=26), female (n=23), male (n=3), age range: 13-17, race/ ethnicity: not specified	Sexual abuse with PTSD, internalizing disorders, and healthy controls

Skokauskas, N., Carballedo, A., Fagan, A., & Frodl, T. (2015). The role of sexual abuse on functional neuroimaging markers associated with major depressive disorder. The world journal of biological psychiatry : the official journal of the World Federation of Societies of Biological Psychiatry, 16(7), 513–520. https://doi.org/10.3109/15622975.2015.1048723	Ireland	**Emotional Stimuli:** Emotional attention shifting task: asked to process visual stimuli and answer yes or no questions like "was it positive?," "was it negative?," and "was it neutral?" or to its shape "was it horizontal" or "was it vertical?."	This study aimed to clarify the role of sexual abuse (SA) on functional imaging markers associated with mdd.	Total (n=93), MDD without sexual abuse (n=37), female (n=25), male (n=17), MDD with sexual abuse (n=13), female (n=6), male (n=7), Healthy controls (n=43), female (n=23), male (n=20, age range: 18-65, race/ethnicity: not specified	Sexual abuse, Major Depressive Disorder (MDD)
Noll-Hussong, M., Otti, A., Laeer, L., Wohlschlaeger, A., Zimmer, C., Lahmann, C., Henningsen, P., Toelle, T., & Guendel, H. (2010). Aftermath of sexual abuse history on adult patients suffering from chronic functional pain syndromes: an fMRI pilot study. Journal of psychosomatic research, 68(5), 483–487. https://doi.org/10.1016/j.jpsychores.2010.01.020	Germany	**Emotional Stimuli:** Participants underwent an interview, imagining themselves to be in the painful situations depicted in the photos (“self”-perspective) and were instructed to rate the pain intensity from a “self”-perspective on a scale from 0 (no pain) to 9 (strongest pain imaginable).	This preliminary study investigates the neural-substrates of empathy-induced pain in multisomato-form pain patients “with vs. without” a history of sexual abuse during childhood.	Total (n=16), History of SV and suffer from multisomato-form pain disorder (n=8), female (n=7), male (n=1), non-abused, matched controls with multisomato-form pain disorder (n=8), female (n=7), male (n=1), age range: 22-67, race/ethnicity: German-speaking	Sexual abuse
New, A. S., Fan, J., Murrough, J. W., Liu, X., Liebman, R. E., Guise, K. G., Tang, C. Y., & Charney, D. S. (2009). A functional magnetic resonance imaging study of deliberate emotion regulation in resilience and posttraumatic stress disorder. Biological psychiatry, 66(7), 656–664. https://doi.org/10.1016/j.biopsych.2009.05.020	USA	**Emotional Stimuli:** In an event-related paradigm, neutral and negative pictures were presented. All pictures chosen for this study depicted human content, and during each trial, subjects received one of three auditory regulation instructions via headphones, to “diminish,” “enhance,” or “maintain” responses to negative pictures.	In this project, we examined the neural mechanisms underlying differences in response to sexual violence, focusing specifically on the deliberate modification of emotional responses to negative stimuli.	Total (n=42), Women with PTSD (n=14), Trauma-exposed women non-PTSD (n=14), Non-traumatized healthy women (n=14), age range: 20-55, Race/Ethnicity: Hispanic (n=12), African American (n=12), Caucasian (n=12), Asian (n=3), Other (n=2)	Sexual violence

Landré, L., Destrieux, C., Andersson, F., Barantin, L., Quidé, Y., Tapia, G., Jaafari, N., Clarys, D., Gaillard, P., Isingrini, M., & El-Hage, W. (2012). Working memory processing of traumatic material in women with posttraumatic stress disorder. Journal of psychiatry & neuroscience : JPN, 37(2), 87–94. https://doi.org/10.1503/jpn.100167	France	**Emotional Stimuli:** * For the identity task participants were sequentially presented 15 pairs of words for 2 seconds each, and they were instructed to determine whether words were identical or different on each trial. * For the 3-back task participants were presented 10 words for 3 seconds each, and they had to determine whether the item was identical to the one from 3 trials previous.	This study investigated the effects of trauma-related words processing on working memory in patients with PTSD.	Total (n=34), Women with PTSD (n=17), Controls (n=17), age range:18-40, race/ethnicity: not specified	Sexual abuse related PTSD
Bremner, J. D., Vermetten, E., Schmahl, C., Vaccarino, V., Vythilingam, M., Afzal, N., Grillon, C., & Charney, D. S. (2005). Positron emission tomographic imaging of neural correlates of a fear acquisition and extinction paradigm in women with childhood sexual-abuse-related post-traumatic stress disorder. Psychological medicine, 35(6), 791–806. https://doi.org/10.1017/s0033291704003290	USA	**Fear Stimuli:** Subjects were told at the beginning of the study that they would be exposed to electric shocks on their left wrist and viewing images on a screen during collection of PET and psychophysiology data. During habituation subjects were exposed to a blue square on a screen followed by a blank screen. One PET image of brain blood flow was obtained starting from the beginning of each of the blocks. During active fear acquisition exposure to the blue square (CS) was paired with an electric shock to the forearm.	We hypothesized increased amygdala function with fear acquisition, and decreased function or failure of activation in medial prefrontal cortex during fear extinction, in women with abuse-related PTSD compared with controls.	Total (n=19), Women with early childhood sexual-abuse-related PTSD (n=8), Women without abuse or PTSD (n=11), age range: 25-48, race/ethnicity: not specified	Childhood sexual-abuse-related post-traumatic stress disorder

Grant, M. M., Cannistraci, C., Hollon, S. D., Gore, J., & Shelton, R. (2011). Childhood trauma history differentiates amygdala response to sad faces within MDD. Journal of psychiatric research, 45(7), 886–895. https://doi.org/10.1016/j.jpsychires.2010.12.004	USA	**Facial stimuli:** The task was designed to identify the influence of valence on the efficiency of selective attention by emotion (positive, sad, and neutral) and level of task difficulty (non-conflict, congruent and incongruent). Participants were instructed to respond with a predetermined button press (index or middle key) to identify either male or female centralized target faces and asked to respond as quickly and accurately as possible.	We sought to determine whether heightened amygdala response is a core feature of depression or a general risk factor for psychopathology secondary to early life stress.	Total (n=36), Major Depressive Disorder (n=10), Major Depressive Disorder (n=10), healthy controls (n=16), female (n=21), male (n=15), race/ethnicity: not specified	Depression and early life trauma
Zhu, J., Lowen, S. B., Anderson, C. M., Ohashi, K., Khan, A., & Teicher, M. H. (2019). Association of Prepubertal and Postpubertal Exposure to Childhood Maltreatment With Adult Amygdala Function. JAMA psychiatry, 76(8), 843–853. https://doi.org/10.1001/jamapsychiatry.2019.0931	USA	**Facial stimuli:** The implicit emotional face-matching paradigm consisted of 3 blocks of negative faces and 3 blocks of neutral faces interleaved with 7 blocks of sensorimotor control (geometric shapes).	To identify the type and age of exposure to childhood maltreatment that are associated with hyperactive and hypoactive amygdala responses in young adulthood.	Total (n=202), total with childhood maltreatment (n=150), male (n=84), women (n=118), race/ethnicity: White (n=140), Asian (n=32), Black (n=18), Hispanic (n=26), Other (n=12)	Childhood Maltreatment

The majority of studies included adult participants. Van den Bulk et al[53] studied adolescents and Zhu et al[51] studied young adults. Four of the studies sampled adult women.[49, 52, 57, 59]

Countries of Publication. The studies were conducted in six different countries. Four studies came from the USA,[49, 51, 54, 59] two were from France,[52, 57] two were from Germany,[50, 58] one came from the Netherlands,[53] one came from Ireland,[56] and one was from Mexico.[55]

Emotional Facial Stimuli Used. Five studies used facial stimuli with positive, neutral, and negative faces. The negative faces varied from being described as fearful faces, sad faces, or negative faces. All studies used at least one type of negative face. Van den Bulk et al,[53] Grant et al,[54] and Quidé et al[52] all used happy or positive faces, neutral faces, and a negative face. Van den Bulk et al[53] used a face-processing task with fearful, neutral, or happy faces followed by randomly presented questions to participants about how afraid they were, how happy they were, and how wide the nose of the person they were viewing was on a four-point scale. While Van den Bulk et al[53] used fearful faces, Grant et al,[54] and Quidé et al[52] used sad faces as their "negative" stimuli. Grant et al[54] used a task to identify how positive, sad, and neutral faces influence the efficiency of selective attention and level of task difficulty. Participants were instructed to press a button and identify either male or female target faces. Similarly, Quidé et al[52] used happy, sad, and neutral facial expressions and presented participants with a target category of male or female and then asked to press a button only when the face matched their target category.

Zhu et al[51] and Dannlowski et al[50] used a related approach. Zhu et al[51] used an emotion face-matching paradigm with negative and neutral faces. Meanwhile, Dannlowski et al[50] had participants view a trio of faces expressing anger or fear and instructed them to select one of two faces on the bottom of the screen that was identical to the target face on top. Dannlowski et al[50] also used the same activity but with shapes like circles and ellipses.

Other Forms of Emotional Stimuli Used. Six studies that used other forms of emotional stimuli. One assessed emotions in social situations,[55] three showed emotional words and or pictures,[56-57, 59] and two used a fear-related task.[49, 58] One study had participants watch a video illustrating social situations where the participants' emotions, thoughts, and social intentions were assessed.[55]

Similar to the facial tasks, Skokauskas et al[56] showed participants a picture and had them answer a yes or no question that referred either to the emotional valence of a picture and used the questions "was it positive?," "was it negative?," "was it neutral?" or to its shape "was it horizontal," or "was it vertical?." Likewise, New et al[59] used a similar event-related paradigm with neutral and negative pictures depicting human content to assess nontrauma-specific emotional processing. Participants were asked via headphones to do one of three regulation instructions to "diminish," "enhance," or "maintain" responses to negative pictures. In contrast, Landré et al[57] used a variety of tasks involving emotional or traumatic and neutral words.

Fear stimulating tasks were used during two different studies.[49, 58] In the study conducted by Bremner et al,[49] participants were randomly assigned into the active condition or control condition. Participants were exposed to fear acquisition and given electric shocks while viewing shapes on a screen. Noll-Hussong et al[58] had participants familiarize themselves with the stimuli and procedure before the neuroimaging. After the neuroimaging participants were told to imagine themselves to be in the painful situations depicted in the photos as a self-perspective exercise and rated the pain intensity on a scale from 0 (no pain) to 9 (strongest pain imaginable).

Brain Response Findings. Table 2 summarizes the brain responses studies synthesized found (see Figure 2 for a diagram indicating brain areas where response patterns were found). Findings displayed that in all of the studies, SV survivors displayed significantly heightened brain response patterns when exposed to emotional stimuli compared to control groups. Most commonly when displayed a stimuli, there was a heightened temporal lobe response (n=8) with the amygdala response being the most common within the temporal lobe (n=5).[49-51, 53-55, 57-58] Noll-Hussong et al[58] found lower activation in the left hippocampus. Three studies found an overall increase in amygdala activation.[50-51, 53] Grant et al[54] found activation of the right amygdala and Bremner et al[49] found activation of the bilateral amygdala. In addition to overall activation of the amygdala, van den Bulk et al[53] also found a left amygdala response.

Eleven studies met the criteria after full text review. See Table 1 for a summary of the studies found. Ten of the 11 studies used an fMRI to measure brain responses, while Bremner et al[49] was the only study that used a PET scan. Five studies used facial stimuli.[50-54] Six studies used some other type of emotional stimuli.[49, 55-59] All studies were published between 2005-2019.

Figure 2: Results in Different Parts of the Brain

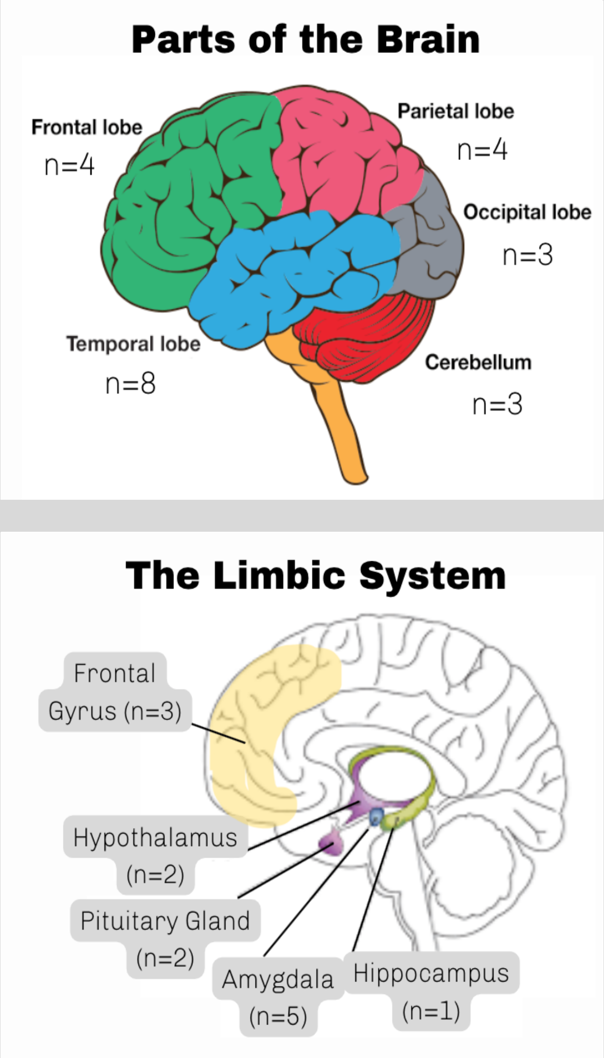


Table 2: Summary of Brain Responses to Emotional Stimuli

Parts of the Brain	# of Articles	References
Temporal Lobe	8	31-32, 34-37, 39-40
Amygdala Specific (found in temporal lobe)	5	31-32, 34-36
Parietal Lobe	4	31, 38-39, 41
Frontal Lobe	5	31, 37, 39-41
Frontal gyrus (found in frontal lobe)	3	31, 39-40
Occipital Lobe	3	31, 36, 39
Cerebellum	3	31, 33, 39
Cortisol (Hypothalamus, pituitary gland, adrenal glands)	2	32, 33

Skokauskas et al,[56] Landré et al,[57] and New et al[59] found higher activation in the parietal lobules. Skokauskas et al[56] identified higher responses specifically in the left inferior and superior parietal lobe. New et al[59] found activation of the intraparietal sulcus. However, Bremner et al[49] found a decreased function in inferior parietal lobule function.

Five studies found responses in the frontal lobe. Bremner et al[49] and Duque-Alarcón et al[55] found responses in the medial prefrontal cortex (MPFC). Bremner et al[49] found connectivity of the left MPFC with other parts of the brain and Duque-Alarcón et al[55] found decreased function in MPFC. New et al[59] found activation of the lateral prefrontal cortex. Landré et al[57] found overactivation of the left pars orbitalis. Landré et al[57] also found activation in the motor cortex with activations in supplementary motor areas and activations in premotor cortex. Noll-Hussong et al,[58] Landré et al,[57] and Bremner et al[49] found higher activation of the frontal gyrus. Noll-Hussong et al[58] and Landré et al[57] found higher activations in the left lateral and medial superior frontal gyrus while Bremner et al[49] found increased activation in the right inferior frontal gyrus.

Three studies identified cerebellar activation.[49, 52, 57] Quidé et al[52] found deactivation in the dorsal anterior cingulate cortex. Both Quidé et al[52] and Zhu et al[51] found cortisol responses. Quidé et al[52] found lower levels of morning cortisol while Zhu et al[51] found an increased adrenocortical response.

Activation in the occipital lobe was found by Landré et al[57] and Dannlowski et al.[50] Specifically, Landré et al[57] found activation of the superior and middle occipital gyrus. Bremner et al[49] found a decreased function in the visual association cortex.

Discussion

The findings of these studies suggest that a history of SV is associated with neurocognitive changes in response to emotional stimuli. SV survivors displayed significantly heightened brain response patterns in the temporal lobe (n=8), parietal lobe (n=4), and frontal lobe (n=5). Ten of the 11 studies used functional magnetic resonance imaging (fMRI) to measure brain responses, while one[49] used a PET scan. The emotional stimuli used varied greatly across studies, making it difficult to draw definitive conclusions on relationships between emotional stimuli and brain reactivity.

This review revealed that brain differences were most often seen in the temporal lobe, with the most studied areas being the amygdala and hippocampus. This could explain differences in learning and memory (hippocampus) and heightened incidences of anxiety, depression, and PTSD (related to amygdala dysfunction) that is frequently seen in SV survivors compared to their peers. SV.[2, 17, 60-62] In addition, activation in the parietal lobes was seen in several studies, which has been linked to differences processing somatosensory information.[63] This could explain why trauma from SV has been associated with physical pain, chronic pain, and disability.[64]

Five studies found responses in the frontal lobe,[49, 55, 57-59] with three of these studies finding activation in the frontal gyrus, a large brain region with a variety of functions mostly related to cognition.[65-66] Responses in this area could indicate decreased cognitive functioning, which has been found in survivors of SV in other studies.[67]

The emotional stimuli used varied across studies, making it difficult to draw definitive conclusions in this review. In addition, many studies lacked accompanying behavioral data, making it difficult to discern how these brain differences impacted subsequent behavior. Future research should attempt to repeat the studies synthesized with larger and more diverse SV survivor samples to better articulate connections between survivor brain responses, emotions, and behavior.

This review revealed several gaps in this area of research. For example, men and non-binary people who experienced SV were not studied in any of the research synthesized. In addition, many of these studies had primarily white samples or did not take note of the races and ethnicities included. Third, sample sizes were small across studies, although this may be a function of the expense associated use of fMRI and PET scans. By using newer, cost-effective, and less invasive technology like fNIRS in future work, researchers can collect larger sample sizes on diverse trauma survivors.

This scoping review has several strengths and weaknesses. The weaknesses include reviewing articles available in English only, having only one researcher review titles and abstracts, and only using one database to retrieve scientific literature. While we used PubMed due to consultation with a library scientist who indicated that this was the most comprehensive database for this topic, there may be other databases with studies that are not indexed in PubMed that could give us additional results. In addition, due to the limited number of articles found and the wide variety of emotional stimuli used, caution should be used when interpreting the overall findings of this review. Additional research is needed to better understand not only how SV impacts the brain, but how this impact manifests as behavior or adverse health outcomes.

Conclusion

SV appears to impact reactivity in several areas of the brain. The amygdala appears to be the area most frequently affected and showing the most changes in response to emotional stimuli. Future research should build on these findings with the goal to develop behavioral, cognitive, and neurological interventions to support SV recovery. By understanding the impact of SV on the brain and behavior, we can provide better psychoeducation to patients, understand intervention targets, and measure the impact of interventions at the level of the brain.

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Conflicts of Interest

The authors have no conflicts of interest to declare.

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Statement of Contributions

Elizabeth Pierson led the literature investigation and analysis. She also was responsible for data curation and writing the original manuscript draft. Laura Sinko conceptualized the project and supervised the review methodology. She also supervised the drafting of the manuscript and critically reviewed and edited the final document.

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Ending Disparities for Individuals with Intellectual and Developmental Disabilities in the Organ Transplantation Process

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At each step of the organ transplantation process, significant disparities exist for patients with intellectual and developmental disabilities (IDD).[1-5] While some jurisdictions have attempted to stop this inequity, patients with IDD remain underserved, experiencing reduced access to care and poor health outcomes.[1,6] Many physicians lack the expertise to determine accurate patient outcomes and are prone to define IDD as a contraindication for transplantation.[4] Despite empirically similar post-transplantation survival rates between individuals with and without IDD, organ transplantation is not equitably opportune.[3,7] Physicians can better fulfill their duty to fairly serve their patients through compassionate care and proper education on medical outcomes. Nondiscrimination policies should be adopted at federal, state, and institutional levels to improve access and outcomes for patients with IDD, particularly those in need of organ transplants. In this study, we identify five systematic flaws which contribute to discrimination against patients with IDD. In response, we recommend solutions that can be implemented at federal, state, and institutional levels to: (1) improve physician-patient interactions, (2) debunk false assumptions garnered by physicians about the patient population, (3) encourage equitable treatment opportunities for patients, (4) incite better transparency in the patient evaluation process, and (5) foster a sustainable system of donated resources.

***Keywords**: Intellectual Disability, Transplant, Ethics.*

Transplantation Process

Healthcare is grossly inaccessible to individuals with intellectual and developmental disabilities (IDD).[1-5] Despite approximately one to two percent of the global population having IDD, these individuals experience poorer health outcomes than the general population, which places them at higher risk of chronic conditions at younger ages.[1,6] Scholars have suggested that these disparities are the unfortunate sequalae of a "cascade of disparities," whereby inadequate attention to care needs, health promotion, or access to quality healthcare services results in a higher prevalence of adverse conditions.[1] In addition, many physicians report feeling ill-equipped to treat the IDD population, leading to individuals with IDD feeling singled out in healthcare interactions, feeling unprepared, or unable to understand the purpose of certain procedures.[4]

These disparities are particularly apparent in transplant centers around the United States.[3,7,8] Many physicians are unaware that post-operative survival rates are virtually identical among patients with and without IDD, and they are inclined to deny transplants to individuals with IDD solely because of that diagnosis.[3,7] Patients with end-stage organ failure are typically evaluated by multidisciplinary teams including physicians, social workers, financial counselors, and nutritionists, often with opportunities for patients and their families to question clinical recommendations.[9] This model should, in theory, add an extra level of protection for patients from overt discrimination and unfair decisions. Despite this, biases against the IDD population remain in the organ transplantation process. Sixty percent of US transplant centers report having serious reservations about giving a kidney to someone with mild to moderate intellectual disability.[3] According to a survey in 2006, 38 percent of transplant centers denied listing a child for transplant solely on the basis of a coexisting neurodevelopmental disability.[7]

Fortunately, US lawmakers have begun to address this discrimination at the state level.[3] California has served as a pioneer in state-issued anti-discrimination legislation. In 1996, it enacted a law prohibiting the denial of organs for individuals with IDD solely on their disability, after a woman named Sandra Jensen was denied a heart-lung transplant twice due to her diagnosis of Down Syndrome.10 In recent years, the number of states with similar laws has grown to 34.[11] While this is an important start, truly addressing this disparity requires action across all levels of government and agencies. The Charlotte Woodward Organ Transplant Discrimination Prevention Act, introduced at the federal level in February 2021, would prohibit transplantation-related discrimination by providers based on an individual's disability.[11-13]

Work still needs to be done to address ongoing disparities in the organ transplantation process. The following article identifies five systematic flaws which have permitted discrimination against individuals with IDD and proposes solutions to address them.

1. Physicians are unprepared to work with patients with IDD.

The story of Paul Corby has become an important call for the healthcare community to improve communication and care for patients with IDD. For Paul, a resident of Pennsylvania with autism and several psychiatric conditions, complaints of vomiting, chest pains, persistent cough, rapid palpitations, and anorexia were dismissed as anxiety for three months before his doctors recommended cardiac testing. In truth, Paul was in urgent need of a heart transplant.[3] In general, physicians are less likely to recognize the need for organ transplants and refer their patients with IDD for formal evaluation.[3,4,7,8] In a survey conducted in 2004 by the National Work Group on Disability and Transplantation, only 52 percent of individuals with IDD requesting referral for transplant evaluations received one; approximately one-third of those with a referral never received a formal evaluation.[7] Historically, many syndromes once thought to be "lethal" (e.g., Down Syndrome with duodenal atresia) were predisposed to premature death due to providers' decisions to forgo life-sustaining treatments.[14]

Solution

Physicians must be educated on promoting cultural competency and compassion for their patients.[4,5,7,8,15] The first focus of this training should be disability humility, which encourages physicians to learn about the experience, culture, history and politics of disability.[16] Second, this education should encompass cultivated care, relating to a comprehensive, coordinated, caring, culturally competent, and continuous level of care for patients.[5] While all medical schools in the United States follow basic curricular guidelines for pathophysiology, diagnosis and treatment of diseases to retain accreditation and prepare students for national board exams, public health threads including social determinants of health are largely individualized by each program.[17] A mandatory national curriculum should be established to educate physicians on the complexities of cultural competency in treating patients with IDD. Physicians must be educated on promoting cultural competency and compassion for their patients.[4,5,7,8,15] The first focus of this training should be disability humility, which encourages physicians to learn about the experience, culture, history and politics of disability.[16] Second, this education should encompass cultivated care, relating to a comprehensive, coordinated, caring, culturally competent, and continuous level of care for patients.[5] While all medical schools in the United States follow basic curricular guidelines for pathophysiology, diagnosis and treatment of diseases to retain accreditation and prepare students for national board exams, public health threads including social determinants of health are largely individualized by each program.[17]

A mandatory national curriculum should be established to educate physicians on the complexities of cultural competency in treating patients with IDD.

2. *Medical professionals garner false assumptions about transplant survival.*

Physicians commonly report false assumptions about patient quality of life and post-transplant outcomes.[3,14-16] In reality, individuals with disabilities self-report a similar quality of life as individuals without a disability.[3] Despite this, some physicians have cited a presumed low quality of life as reason to deny transplants for their patients with disabilities.[3] Many providers also falsely assume that post-operative survival of patients with disabilities is inherently lower than patients without disabilities.[18] Evidence suggests that intellectual disability is not, in fact, associated with patient or graft survival among solid organ transplant recipients.

Solution

Quality of life is a reasonable factor to guide medical decision making; however, it should be based factually (i.e., by patient self-report) and not guided by the bias-laden assumptions of medical providers. Physicians have a duty to follow an evidence-based approach to evaluate patients and consider primarily the organ system involved to prognosticate transplant survival.[3,15,16,19, 20] A study of multiply handicapped kidney transplant recipients – the majority of whom had IDD – showed excellent patient and graft survival alongside significant improvements in patient and caretaker quality of life.[21] One solution may consider reframing transplantation eligibility to target a vulnerable population, a model which has already been implemented.[22] For example, early liver transplantation (<6 months after last alcohol use) for severe alcoholic hepatitis improved survival in patients who would have otherwise been excluded from the life-saving intervention. Similarly, providers and patients would benefit from a comprehensive decision-making framework to assess transplant eligibility specifically for individuals with IDD.

3. *There is a lack of social support offered to patients with IDD.*

Physicians are less likely to offer the same treatments to patients with IDD compared to the general population.[3,7] Patients are often turned away due to lack of a support system, or their competence in managing postoperative care is misjudged due to inadequate assessment of their support systems. Additionally, physicians are less likely to offer life-extending treatment alternatives (known as "bridge therapies") to individuals with IDD while waiting for a transplant.[3] For instance, Paul Corby was denied alternatives such as a left ventricular assist device while he awaited his heart transplant. The decision to deny Paul available medical intervention unnecessarily supported an accelerated decline in his condition.

Solution

Physicians must provide the same services to patients with and without IDD, when medically appropriate. Institutions must improve counseling on post-operative care at a level that is appropriate to their patient's comprehension.[3,7,15,19] This includes inviting support individuals to aid in medical decisions and disseminating health information in a format that is easily understandable and accessible. The state of Maryland established an exemplary model, instating a policy that requires reasonable modifications to provide access to transplant services and ensure that these services are not denied due to the absence of auxiliary aids and services.[3,19,23] Additionally, the bill urges providers to consider home- and community-based services for successful post-operative care.[23] All states should adopt policies modeled after Maryland to provide the social support necessary and encourage a successful transplantation process for all individuals.

4. Institutions lack transparency in the organ allocation process.

In the absence of a state- or federal-level nondiscrimination act, hospitals and organ transplant centers have minimal grounds holding them accountable for implicit discrimination against transplant candidates with IDD. The federally mandated multidisciplinary approach to organ allocation is a respectable first step in improving transparency of the process.[9] However, when faced with discrimination, patients still lack the means or access to information necessary to challenge this systemic failure.[3]

Solution

In order to protect patients and ensure accountability in the organ transplant system, it is necessary to establish greater transparency. A national online complaint system or phone hotline could address this issue. One model is a national healthcare grievance redress platform rolled out in Lebanon in the form of a hotline, website and mobile app.[24] In addition, Advisory Committees should be founded within each transplant institution to review cases involving discrimination and ensure fair patient listings.[3,15]

5. Individuals with IDD face discrimination as organ donors.

Individuals with IDD also face discrimination upon request to become living organ donors.[14,19,25] In a previous commentary, Wightman and colleagues argue that the organ pool would become more limited if the waitlist grows but resources do not.[14] As it is unjust to exclude individuals with IDD from receiving a transplant, it is also unjust to deny them the opportunity to donate an organ. It is a human right for all individuals, including those with IDD, to make independent decisions which affect their health and relationships; denying the opportunity to become a donor undermines this autonomy.

Solution

Equitable access to evaluation for living donor candidacy must be standard of care. The organ pool will remain sustainable if equity is encouraged in organ receipt and donation.[3,14] When the healthcare industry succeeds in eliminating discrimination for receiving organs, one can only expect to sustain these resources with a similar level of organ donation. One solution is a national effort to educate physicians about IDD-based discrimination in evaluation of living donor candidacy. The practicality of this initiative again relies on improving the standardization of public health curricula across medical education programs.[17]

Conclusion

It is important to reiterate that empirically, patient survival rates following transplantation are similar between individuals with and without IDD.[7,19] Despite this, organ transplantation is not equitably available to patients with IDD.[3,5,6] This issue has become especially relevant during the COVID-19 pandemic, when states used existing transplant guidelines as models for distributing life-saving resources such as ventilators.[26]

This article has proposed several initiatives to be adopted broadly at federal, state, and institutional levels to improve access and outcomes for patients with IDD. In sum, efforts should be made to (1) improve physician-patient interactions, (2) debunk false assumptions garnered by providers about the patient population, (3) encourage equitable treatment opportunities for patients, (4) incite better transparency in the patient evaluation process, and (5) foster a sustainable system of donated resources.

There are many sophisticated considerations involved in organ allocation, including the scarcity of solid organs for transplant and the value of a holistic approach in candidacy evaluation. None of these considerations justify denying life-saving measures to an exclusive population with favorable projected transplant outcomes. Physicians can better fulfill their service to patients when they are equipped with sufficient education on medical outcomes and provide compassionate care for patients who have IDD.

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Family Leave in the United States Should be Expanded

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The United States of America (USA) is one of only three countries around the world and the only Economic Co-operation and Development (OECD) country that does not guarantee paid leave for caregivers of newly born or adopted children (e.g., "family leave").[1-2] Family leave influences how a child will be raised, who will be spending the most time with a child, and what resources parents can afford for their child. Given the lack of a federal policy, Washington DC and nine states (California, Colorado, Delaware, Maryland, Massachusetts, New Jersey, New York, Oregon Rhode Island, Washington) independently offer paid family leave policies. Certain private employers offer paid family leave as well. As a result of this patchwork approach, in the USA only 59% of workers are covered by federal family leave policy (the Family and Medical Leave Act [FMLA]), which guarantees only unpaid leave, and only 11-16% have access to paid family leave.[3,10]

Research documents that paid family leave is associated with numerous positive outcomes for children and families. Related to children, improved outcomes include healthier birth weight, fewer infant deaths, improved long-term achievement, and greater academic success.[2,3] Even the 1993 implementation of FMLA, requiring only that employers offer employees the ability to take up to 12 weeks of unpaid leave, showed a reduction in infant mortality, and research suggests that that with paid leave there would be an even larger drop of 13%.[3] Being able to spend time to nurture children has proven to positively impact the child's IQ and college attendance, while reducing school dropout rates and teenage pregnancy. Studies have demonstrated that with a six-month extension of family leave, infants had a 40% increase in being able to exclusively breastfeed at only six months old.[3] Additionally, having parents at home post-birth has resulted in higher adherence to childhood vaccination schedules and a 46% reduction in rehospitalization within the first year.[10] For mothers, being able to take family leave without stress from a lack of income allows for better maternal health, including reductions in stress and improvements in mood when mothers were able to rest and bond with their baby throughout their leave.[2,3] The presence of paid family leave also has been found to be associated with lower rates of postpartum depression which is one of our nation's most critical mental and public health concerns.[10] Not only is paid family leave beneficial for mental health, but studies have also found that it is beneficial to physical health as well which is important for recovery after birth.[10] Mothers without paid leave are more likely to return to work quickly; for example, one investigation found that 23% of mothers without paid leave return to work within 10 days of birth.[1,2] Additionally, evidence demonstrates that certain aspects of family leave policies, such as protected leave time for fathers, incentives for fathers to take leave, and prohibition of father's ability to transfer leave to mothers, are effective in increasing fathers' involvement in child rearing, better socio-emotional child health outcomes, higher rates of maternal return to the workplace, and higher rates of breastfeeding.[3]

Despite the evidence supporting adequate family leave, policies vary greatly across countries. For example, certain countries coverage includes more than one parent (e.g., mothers and fathers in Iceland and Israel) and other countries' coverage includes only mothers or child-bearing parents, coverage ranges in duration from 12 weeks in the United Kingdom and Mexico to 85 weeks in Estonia, and amount of income replaced is partial in certain nations (e.g., 55% in Canada) and comprehensive in others (e.g., 100% in Spain).[3,10] One country that is often considered an exemplar related to paid family leave is Sweden, as Sweden offers comprehensive family leave policy, demonstrates excellent child health outcomes, and was the first nation to offer paid leave for fathers.[3,11] The purpose of this opinion piece is to summarize and compare the federal family leave policy of the USA and Sweden (as an exemplar country with a more comprehensive policy) and to present recommendations for how the USA can improve its current policy.

Family leave in the USA applies only to one parent and does not guarantee pay. Under the FMLA,[13] the primary federal policy dictating family leave in the USA, eligible employees choose to take up to 12 weeks of job-protected leave for certain family and medical reasons, including adoption or birth of a child. Employers may but are not required to provide pay during that leave.[1-4] The weeks cannot be transferred between parents or start prior to the child's birth. FMLA eligibility is limited to employees with 12 months of service at their employer, who have worked at least 1,250 hours over those 12 months, and who work for an employer with at least 50 employees within 75 miles. As a result, estimates suggest that up to half of American employees are not eligible for FMLA.[2-3]

Many private employers in the United States independently offer family leave policies that are more robust than FMLA. For example, Amazon offers an extensive paid family leave policy that includes up to twenty weeks of fully paid leave for the birthing parent including four weeks before the baby is born.[14] Supporting parents and adoptive parents are offered six weeks of fully paid leave, and a Leave Share program allows employees to give six weeks of paid leave to their partner if their workplace does not provide them with paid leave.[14] Policies such as Amazon's demonstrate how private employers provide support that is lacking in FMLA to families.

In comparison, Sweden's family leave policy offers increased duration, greater flexibility, and financial support. Sweden offers 480 days of leave, with each parent being entitled to 240 of those days, and leave can be taken up to 60 days prior to the expected birth. Leave can be used throughout a child's early years, though 384 days must be taken before age 4 and the remaining before age 12. Leave is paid, though the level of monetary support given depends on the amount of time taken in addition to the income of the family. A comparison of key differences in Sweden versus the USA's policies are presented in Table 1.

Our opinion is that to improve the USA's policy, family leave should apply to all parents equally, be longer, and have guaranteed pay – similar to Sweden's approach. More specifically, we recommend at least 12 weeks of paid family leave with guaranteed job protection, that parents of all genders be eligible for leave, that parental leave not be transferrable between parents (e.g., no transfer from one parent to another) to avoid gender inequity in leave taking, and that all parents be incentivized to take leave. Our recommendations build upon the USA's existing framework of 12 weeks of leave available via FMLA, but expand by requiring that leave be paid and increasing involvement of all parents (rather than only the child-bearing parent) – all suggestions consistent with research evidence and common in other OECD nations. Our recommendations align with – though are more comprehensive than – recent legislation. For example, the Build Back Better spending plan led by the administration of President Joseph R. Biden originally proposed 12 weeks of paid leave with more comprehensive eligibility requirements than that of FMLA; however the plan was pared down significantly during negotiations and eventually not passed by Congress. The recently passed Inflation Reduction Act[14] included select aspects related to the Build Back Better plan, though the family leave components were not included. We advocate for ongoing

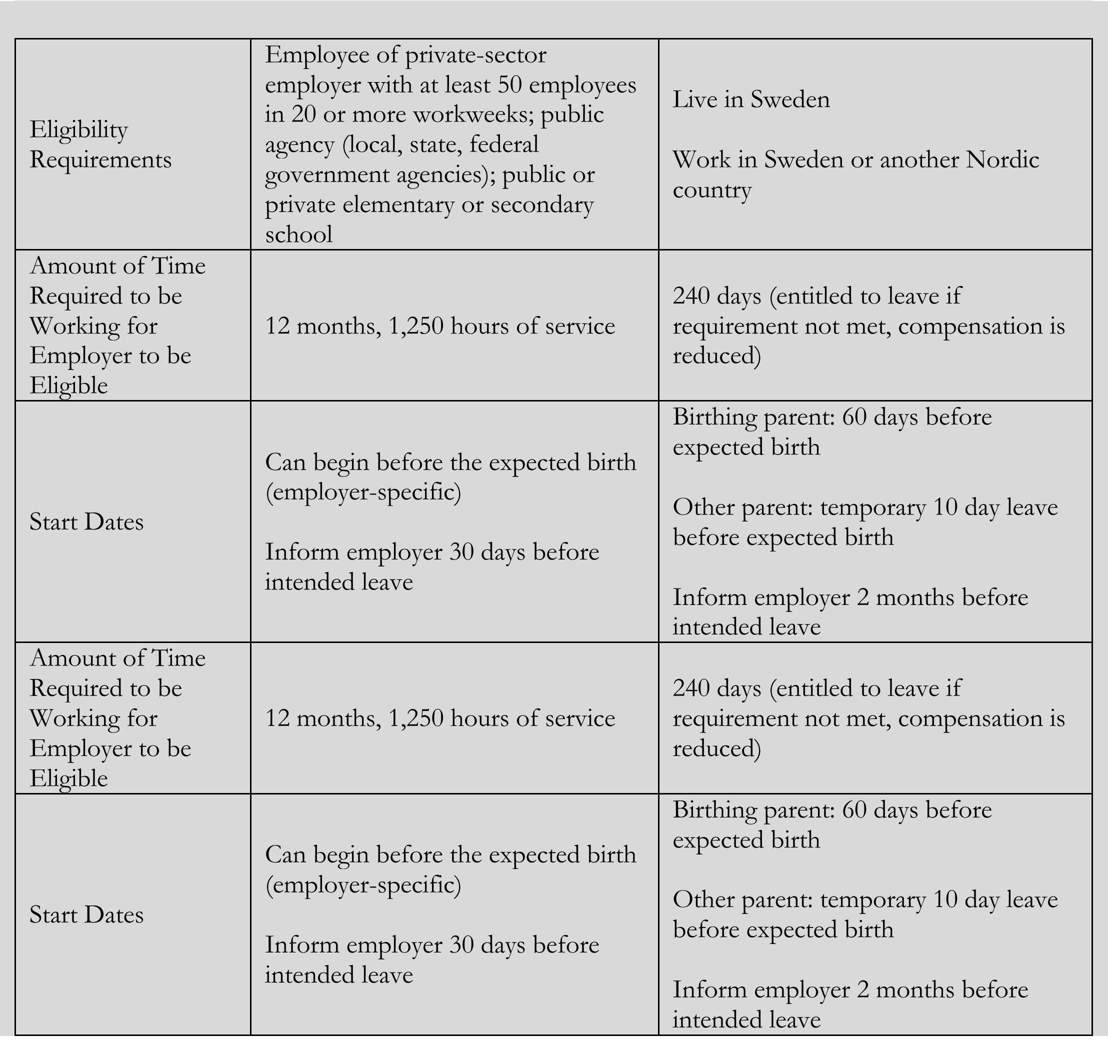
Congressional negotiations about improving federal family leave policy.

Our recommendations would support greater involvement of non-childbearing parents, increased duration and flexibility of parental involvement during the early years of a child's life, and financial resources for families. They align with major professional organizations including the International Labor Organization, the American Academy of Pediatrics, the American Public Health Association, and the American College of Obstetricians and Gynecologists.[6-9] Our recommendations are consistent with evidence demonstrating associations between more comprehensive, paid family leave and better child and parent outcomes.[2-3]

Children are the future. Prior expert recommendations and research suggest that expanding family leave will better support children and parents in the USA. The USA can learn from countries, such as Sweden, that have more comprehensive policies. In closing, we argue for changes in the USA family leave policy to support better child health outcomes.

Table 1 – Comparison of Family Leave Policies: United States of America's Family and Medical Leave Act versus Sweden's Family Leave Policies

	United States of America's Family and Medical Leave Act	Sweden's Family Leave Policies
Conditions of New Child Placement	Child must be a biological, adopted, fostered, stepchild, legal ward, or in *loco parentis*	Must have custody of child or live with/have a relationship with a parent of the child
Duration of Leave	12 work weeks (60 workdays) within the 12 months post birth/placement Can block time off intermittently	480 days for 1 child (+ 180 days per additional child) Workday flexibility (whole or parts of days)
Paid	No, but may use vacation or paid-time-off (PTO) time	Yes Must be covered by social insurance Level of benefit dependent on income and amount of parental leave used Pregnancy cash benefit: around 80% of salary if have a strenuous or hazardous job that limits working ability while pregnant Temporary parental benefit: for care of sick child if income is lost
	United States of America's Family and Medical Leave Act (cont.)	Sweden's Family Leave Policies (cont.)
Applicable to Both Parents	Yes	Yes
Transferrable between Parents	No	Yes (up to 150 days)
Applicable to adopted or foster care children	Yes	Yes



Eligibility Requirements	Employee of private-sector employer with at least 50 employees in 20 or more workweeks; public agency (local, state, federal government agencies); public or private elementary or secondary school	Live in Sweden Work in Sweden or another Nordic country
Amount of Time Required to be Working for Employer to be Eligible	12 months, 1,250 hours of service	240 days (entitled to leave if requirement not met, compensation is reduced)
Start Dates	Can begin before the expected birth (employer-specific) Inform employer 30 days before intended leave	Birthing parent: 60 days before expected birth Other parent: temporary 10 day leave before expected birth Inform employer 2 months before intended leave
Amount of Time Required to be Working for Employer to be Eligible	12 months, 1,250 hours of service	240 days (entitled to leave if requirement not met, compensation is reduced)
Start Dates	Can begin before the expected birth (employer-specific) Inform employer 30 days before intended leave	Birthing parent: 60 days before expected birth Other parent: temporary 10 day leave before expected birth Inform employer 2 months before intended leave

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Conflicts of Interest

All authors declare no conflict of interest.

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Statement of Contributions

Amanda Ng and Alexa Sparango conceptualized this manuscript. Amanda Ng and Alexa Sparango wrote the first draft. Amanda Ng, Alexa Sparango, and Krista Schroeder revised the final version of manuscript.

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