

The 3rd URNCST Journal Case Abstract Competition: Sex-Based Comparisons Research



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Abstract

The URNCST Journal Case Competition provides undergraduate students with the opportunity to experience the peer review and publication process through participation in a case competition. Participants submit an abstract of a research protocol based on a topic proposed by the URNCST Journal. The following abstracts were submitted by undergraduate students to the 3rd URNCST Journal Case Competition held during April 2019. To learn more about this abstract competition and submit your own, please visit: <https://urncst.com/index.php/competition/about>. This case competition's topic was on sex-based comparisons research. The emergence of sex-based research has become more prominent within the last decade. Sex is often defined as the biological or genetic makeup of the body. The impact of sex-based differences has been observed in diverse fields, ranging from cardiovascular health, to addictions and mental wellness, to drug efficacy and its cellular implications. As a result, we welcomed abstract submissions from any science or technology discipline exploring sex-based comparisons in their research field.

Keywords: sex-based comparisons; abstract competition; URNCST Journal

Conference Abstracts

The following abstracts were peer-reviewed for quality of research content following being submitted to the URNCST Journal Case Competition. Abstracts are ordered alphabetically by last names of the first authors.

Sex-Based Comparisons Research Abstracts

Biological Sex Gaps between Accessing Therapeutic Services in the Paediatric Population

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Introduction: Cerebral palsy (CP) is a neurological condition that originates from abnormal development or damage to the developing brain. It is the most common physical disability in childhood that affects muscle tone, movement, and motor skills. CP patients require immediate services, including physiotherapy and occupational therapy, in order to manage the condition. This study aims to identify any gaps between the quality of services offered to children and youth based on biological sex.

Methods: A sample of 1000 children and youth (500 of each genotype) between the ages of 4-18 will be included across all levels of the Gross Motor Function Classification System (GMFCS), along with their parents. A questionnaire will be administered with questions analyzing the duration of the therapy sessions, level of difficulty of exercises, as well as the patient's responsiveness to therapy (willingness to participate).

Results: The results of this study will highlight trends observed from the participants surveyed. Duration of therapy sessions, level of difficulty of exercises, as well as the patient's willingness to participate all evidently factor into the quality of services received.

Conclusions: This study will suggest if biological sex is a significant factor for CP patients when dictating timing and proportion of therapy services provided. Moving forward, this bias will be key evidence to take into consideration in order to ensure that both genotypes of CP patients are provided with the necessary services more efficiently to implement the best clinical outcomes.

Implications: Health care professionals should be aware of the biological sex biases experienced by diverse patients and have open communications with the individual and their parents on the importance of receiving such services. Furthermore, increased trend differences between biological sex should ponder upon gaps of quality of services received.

Protective Effects of Estrogen and Testosterone on Type 2 Diabetes Mellitus

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Introduction: The current literature has been limited to correlational studies and mixed findings pertaining to the protective effects of estrogen and testosterone against Type 2 diabetes mellitus (T2DM) patients across the sexes. Using hormone-matched male-female pairs of T2DM rat models to measure insulin resistance (IR) as indication of T2DM symptom severity, this experiment aims to clarify whether the sex-differences pertain to protective effects of sex-hormones against T2DM.

Methods: 24 male-female pairs of 12-months-old Nile grass rat (NGR) were captivated and fed a high-fat diet for 6-weeks to induce T2DM confirmed by blood glucose level and IR using hyperinsulinemic-euglycemic clamp experiments. Endogenous hormones were suppressed using GnRH antagonists cetrorelix in all pairs. 12 male-female NGR pairs were supplemented with either none, low, medium or high (3 pairs in each category) 17 β -estradiol levels, and 12 other NGR pairs were similarly matched with none, low, medium or high testosterone levels, twice daily for 3 consecutive days and incubated for 7-days. Hormone levels were monitored through blood samples. IR change assessment were conducted post-incubation period. Statistical analyses were performed using ANOVA.

Results: It is hypothesized that relatively higher levels of sex hormone treated groups should display lower IR levels compared to controls or low hormone treated groups. IR measured between each NGR pair should display similar results across conditions.

Conclusion: Higher sex-hormone levels are associated with greater protective effects against T2DM. If hormone matched male-female pair show similar symptom severity or IR, then T2DM epidemiology across men and women can partly be attributed to protective effects of the sex-hormones, rather than other sex-related factors.

Implications: This study should strengthen the reliability of hormone therapies considered for T2DM prevention and treatment measures. It should promote further studies investigating protective effects of sex-hormones across other medical ailments, which would help redefine presumed sex differences in epidemiology.

Infectious Addiction: Looking at the Effect *Toxoplasma gondii* Has on the Dopaminergic

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Introduction: *Toxoplasma gondii* (*T. gondii*) is a unicellular protozoan parasite that infects cats as a definitive host, as well as a large spectrum of other creatures, including humans, as intermediate hosts. Several studies have shown that humans infected with *T. gondii* exhibit impulsivity as well as aggressive and risky behaviour. This study aims to test whether such behavioural modifications might be related to changes in the expression of the gene responsible for Dopamine Receptor D2 (DRD2), which is associated with addiction. Additionally, this study will explore the potential for gene expression influenced by genotypic sex and cross-reference the findings with existing sex-based trends observed in addiction studies.

Methods: The study will utilize RT-qPCR to help quantify the level of DRD2 gene expression in individuals affected by *T. gondii* compared to uninfected controls. The genotypic sex of all applicants will be recorded in order to determine whether there are additional relationships between sexes and DRD2 expression in patients with *T. gondii* infections. Two-way analysis of variance (ANOVA) in SPSS will be used to analyze results, with sex, infection status, and their interaction being evaluated.

Results: Prevalence of *T. gondii* infection are hypothesized to be positively correlated with increased DRD2 expression. Additionally, differences between sexes should reflect general data concerning reported rates of addiction, with males having higher levels of DRD2 expression.

Conclusion: This study will help provide further insight about different contributing factors in addiction, in addition to impacts that certain protozoan parasites have on human behaviour and gene expression. Follow up studies could involve further investigations in other dopaminergic receptor pathway gene expression.

Implications: There is considerable stigma associated with addiction and the effectiveness of many addiction treatments is low. This study will potentially help decrease incidence of damaging addictive behaviours among individuals infected by new insight to the complex nature of addiction.

Increased Expression Levels of Interleukin-17F Gene Polymorphisms as Indicators for Elevated Risk of Rheumatoid Arthritis in Females: A Research Proposal

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Introduction: Rheumatoid Arthritis (RA) is a deteriorative autoimmune disease of the joints which disproportionately affects females in a 3:1 ratio with males. Emerging evidence suggests that unique gene polymorphisms of interleukin-17F (IL-17F), labelled IL-17F 7488 A/G and IL17F 7383 A/G, may be expressed at significantly higher concentrations in the blood serum of females with rheumatoid arthritis when compared to males. These gene polymorphisms are predicted to serve as efficient prognostic biomarkers in the early detection of the disease in patients with RA due to their easier availability for extraction. This review will aim to examine the expression levels of IL-17F polymorphisms in both male and female patients in order to validate the presence of any sex-related differences in the pathophysiology of the disease.

Methods: Literature searches will be conducted using the PubMed database for high quality systematic reviews and meta-analyses examining the expression levels of the specific IL-17F gene polymorphisms in both sexes diagnosed with RA. Keywords including “Interleukin-17F/genetics”, “rheumatoid arthritis” and “female” will be specified within the MESH search tool to further specify studies conducted that are relevant to the research proposal.

Results: By examining the differences in the expression levels of the IL-17F gene polymorphisms in both groups of patients, it is anticipated that the female patients with RA will show significantly higher expression levels of the polymorphism in comparison to male patients.

Conclusion: This study will validate the presence of any sex-related differences in the pathophysiology of chronic rheumatoid arthritis in males vs females. Implementation of this research proposal indicates promising results in using IL-17F gene polymorphisms as biomarkers for early detection of the disease process.

Implications: Identification of such sex-related differences will lead to pioneering clinical interventions towards female patients with RA and halt the progression of the disease at an earlier stage.

Conflicts of Interest

The authors declare that they have no conflict of interests.

Authors' Contributions

JSW: developed the case competition topic, reviewed submitted abstracts and provided feedback to authors for revisions, and completed the draft abstract book for typesetting and final publishing.

JBS: ensured abstracts adhered to correct formatting standards, drafted the conference abstract booklet, and gave final approval of the version to be published.

JN: designed and founded the URNCST Journal Case Abstract Competitions, provided support during the abstract review, ensured abstracts adhered to correct formatting standards, reviewed the drafted abstract booklet, and gave final approval of the version to be published.

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