Proceedings of the 2nd International Conference on Modern Medicine and Global Health
DOI: 10.54254/2753-8818/45/20240523

The inquiry of association between intellectual disabilities and physical disabilities

Kyubin Park[1,4,5,†], Eunseo Eo[2,6,†], Jihwan Lee[3,7]

[1]St. Johnsbury Academy Jeju, Seogwipo-si 63644, Republic of Korea,
[2]Saratoga High School, Saratoga CA, 95070, United States of America
[3]Korea International School Jeju Campus, Seogwipo-si, 63644, Republic of Korea
[4]Corresponding author

[5]s17011325@sjajeju.kr
[6]eeunseo26@gmail.com
[7]jhlee24@kis.ac
[†]These authors are co-first authors

Abstract. This paper shows the associations between intellectual and physical disabilities. The lack of data concerning the individuals with disabilities population has motivated us to research further upon this topic. The topic deals with people who have physical disabilities and people who have intellectual disabilities in specific states in the U.S. Data about individuals grappling with both physical and intellectual disabilities within California, Texas, and Pennsylvania, spanning the years from 1980 to 2018, was assembled. R-squared values, indicative of the strength of the relationship between occurrences of physical disabilities and intellectual disabilities in these states, were employed to uncover these interconnections. The R-squared values consistently point to a pronounced correlation between these two categories of disabilities. These discoveries imply that individuals with physical disabilities have a heightened likelihood of experiencing intellectual disabilities, and conversely. This study and its associated results serve as a valuable resource for numerous institutions engaged with the people with disabilities community. Furthermore, it equips them with a potent tool for enhanced comprehension of their needs, facilitating the development of more effective and successful contributions.

Keywords: Intellectual Disability, Physical Disability, Association.

1. Introduction

This study delves into the intricate relationship between intellectual and physical disabilities, an area of significant relevance in healthcare and social policy. Intellectual disabilities, as defined by the American Psychiatric Association, involve limitations in intellectual functioning and adaptive [1]. Physical disabilities, on the other hand, encompass impairments affecting physical functioning, mobility, dexterity, or stamina [2]. By analyzing data from California, Texas, and Pennsylvania from 1980 to 2018, this paper aims to illuminate the association between these two disability types. The study leverages R-squared values and other statistical analyses to explore this relationship, offering insights that could influence future research directions, policy decisions, and practical interventions for the affected populations.

DOI: 10.54254/2753-8818/45/20240523

2. Literature Review

A physical disability is defined as a "limitation on a person's physical functioning, mobility, dexterity or stamina" that has a 'substantial' and 'long-term' negative effect on an individual's ability to do normal daily activities and an "intellectual disability is identified by problems in both intellectual and adaptive functioning" [1-2]. The percentage with two or more physical conditions, including hearing loss and hypertension, was more significant for people with intellectual disabilities than for people without intellectual disabilities, presenting a higher chance of carrying physical disabilities when an individual has intellectual disabilities [3]. Several studies previously indicated the possibility of the associations between physical and intellectual disabilities. A study claimed that an individual can obtain physical and intellectual commodities through traumatic brain injury [4]. A single cause that leads to physical and intellectual conditions supports the associations between physical and intellectual disabilities. CDC stated that intellectual disabilities likely cause developmental delays in an individual's body, including slowing or hindering physical maturity [5].

National Institute of Neurological Disorders and Strokes introduced that brain 30-50% of people carry cerebral palsy [6]. This neurological disorder is caused by an abnormal functioning brain that leads to physical disability. The malfunction of the brain leading to physical disabilities such as muscle movement, as well as the high prevalence of intellectual disabilities in people with cerebral palsy, suggests the possible association of the two disabilities, as mentioned earlier.

A study from the University of Washington stated that despite acknowledging disability as a recognized demographic within the interest for promoting participation efforts, the reluctance towards data collection is noticeable, proving that the research regarding disabilities is insufficient in the present society [7]. Our study aims to inquire into the association between intellectual disabilities and physical disabilities, further broadening studies concerning disabilities and improving the quality of life for people with intellectual and physical disabilities. Individuals with disabilities often undergo certain disadvantages, such as lower education levels, lower employment rates, fewer household resources, and poorer health conditions than people without disabilities [8]. By researching the association between intellectual and physical disabilities, we can identify these individuals' specific barriers and develop targeted interventions to address them. According to research presented by NIH, early mortality rates are marked for adults diagnosed with intellectual disabilities compared to the general population.

Moreover, the extent of multimorbidity and associations between comorbidities are still unknown compared to the general population [3]. This research intends to inquire into these unknown associations: if an individual carries intellectual disabilities, there is a higher chance of having physical disabilities, and vice versa, and assist in the establishment of facilities for individuals with intellectual and physical disabilities.

Frontiers Sports Act Living questioned whether physical activities may or may not affect people with intellectual disabilities; however, the primary outcome may change as the study progresses, as the sample size of the study was exiguous, as the authors also acknowledged [9]. A study conducted by the Journal of Intellectual Disability Research confirmed that adults with intellectual disabilities have low physical fitness levels. However, this study is conducted to inquire about the physical ability of people with intellectual disabilities, not how the physical disability relates to intellectual disability [10]. Two other researchers also inquired about the benefits of physical activities to adults with intellectual disabilities, and the study was conducted on adults and physical activities [11, 12].

While the prevailing body of research predominantly delves into the impact of disabilities on either physiological or societal aspects, this inquiry takes a distinctive perspective by examining the intricate interplay between diverse disability types at both biological and statistical strata. Notably, prior studies have often treated individuals with multiple disabilities as a singular category, thus leaving unexplored the nuanced relationship between intellectual and physical disabilities within this subgroup.

Despite the relatively modest prevalence of multiple disabilities, standing at a mere 2% according to the Kansas Department of Education in 2020, it is noteworthy that the most prevalent combination within this category comprises intellectual disability and blindness, as elucidated by Lalit in 2018 [13, 14], This amalgamation essentially represents the convergence of intellectual and physical impairment.

DOI: 10.54254/2753-8818/45/20240523

Using R-squared values within our models, we have successfully discerned a robust connection between physical and intellectual disabilities.

3. Methodology

The chosen analytical framework for the present associative and observational study is time series regression analysis, an established statistical technique widely applied in the forecasting and understanding of the relationships within sequential data. Time series regression analysis hinges upon utilizing historical data points from a given time series to formulate predictions concerning future values. Central to this model is the fundamental assumption that the current state of the time series is intricately linearly linked to its preceding states.

In the first step, fellow researchers gathered numerous data points from different sources for different states in the U.S. It took a little while to realize that the amalgamation of diverse datasets constitutes an invaluable resource for individuals engaged in data-centric endeavors. Such a confluence of information holds the potential to not only enhance the precision and scope of the data but also augment its practical utility. This strategic integration catalyzes unearthing intricate patterns and emergent trends, thereby facilitating predictive insights of paramount significance.

In alignment with this paradigm, our research consortium has diligently curated a comprehensive state-level combined statistical dataset, encapsulating vital information regarding the prevalence of people with intellectual and physical disabilities spanning the temporal continuum of 1980 through 2018.

This study focused on three states: California, Texas, and Pennsylvania. For each state, we collected 76 data points, 38 for the percentage of people with intellectual disabilities and 38 for the percentage of people with physical disabilities. We first processed this data to predict future values. Then, we graphically correlated the two variables by graphing each data point of the percentage of people with intellectual disabilities and physical disabilities for each year. This allowed us to identify the correlation between the two variables for all three states.

In the case of California, the correlation between the two variables, the percentage of physical disabilities and the percentage of intellectual disabilities, was determined graphically, which eventually produced the R-squared value. The R-squared value is always between 0 and 1, and this number represents the proportion of the variance of the chosen dependent variable in a study; in other words, the number shows how accurately a specific model exhibits the data and the variable. Using R, a program used to analyze the correlation by inputting the dataset, fellow scholars have reached that the R-squared value of California is 0.966. A value of 0.966 signifies a compelling association between the two variables. Similarly, the trend was very similar with the remaining two states. The R-squared values in Pennsylvania and Texas were all 0.99, which again proves a high correlation between the occurrence of physical disabilities and the occurrence of intellectual disabilities.

Furthermore, it was observed by fellow researchers that all three states will follow a similar pattern in the future. By using the time series regression analysis model, upon successful estimation of these coefficients, they can furnish invaluable insights into forecasting the trajectory of the time series beyond the bounds of historical data. The predictive process entails leveraging these estimated coefficients to extrapolate the future value of the time series at distinct temporal junctures. This predictive prowess renders time series regression analysis a potent instrument in examining time-evolving data patterns and making informed forecasts.

It was apparent that the percentage of both the percentage of people having physical disabilities and the percentage of people having intellectual disabilities will decrease in the next few years. As mentioned previously, the time series regression analysis allows researchers to investigate future values using past datasets; thus, it is valid to conclude that this study supports our hypothesis that the association between intellectual disabilities and physical disabilities exists in the United States analyzing the values of 1980 to 2018.

DOI: 10.54254/2753-8818/45/20240523

4. Results

While people with disabilities are generally considered a minority, there are about 44 million US citizens with disabilities, composing about 13% of the US population. Additionally, the population of people with disabilities is predicted to increase in the future as a study from MDPI anticipated [15,16].

Researchers have undertaken an analysis of R-squared values, an indicator measuring the robustness of the correlation between two variables, within time-series regression models on the population of individuals experiencing physical and intellectual challenges across California, Texas, and Pennsylvania from 1980 to 2018. Consistently, the R-squared values exhibited noteworthy strength in all three states, manifesting an average of 0.982. Every R-squared value surpassed the 0.7 threshold, underscoring a substantial linkage between physical and intellectual disabilities.

Subsequent research on disabilities should channel its efforts toward the development of optimal therapeutic approaches and support systems, accounting for the pronounced interdependence observed between physical and intellectual disabilities. Furthermore, researchers should explore the particular biological and environmental factors contributing to the emergence of these disabilities, alongside investigating the potential associations between sex chromosomes and the occurrence of intellectual or physical impairments. Research findings have indicated an elevated prevalence of physical disabilities among females and a higher incidence of intellectual disabilities among males [17, 18].

5. Further Discussions

Exploring the relationship between intellectual impairments and physical limitations could be expanded and further advanced by incorporating aspects of economic stability and mortality rates. Economic stability can have diverse effects on the well-being of individuals with intellectual disabilities. For instance, those with intellectual disabilities residing in economically disadvantaged circumstances may encounter barriers to accessing healthcare, nutritious sustenance, and secure housing. Consequently, this may elevate the risk of developing physical disabilities. The consideration of mortality rates is also a pivotal aspect of forthcoming investigations. Individuals with intellectual disabilities facing higher mortality rates might exhibit an increased susceptibility to the onset of physical disabilities.

To delve into the influence of economic stability and mortality rates in the nexus between intellectual disabilities and physical impairments, researchers can adopt a methodology akin to that undertaken by our team: executing a time-series regression analysis. Such an approach would involve longitudinally tracking participants and amassing economic conditions and physical well-being data. Over time, this would enable researchers to discern how fluctuations in economic stability and mortality rates relate to the emergence of physical and intellectual disabilities.

The revelations from this research possess significant ramifications for the care provided to individuals grappling with intellectual and physical challenges. It becomes paramount to proactively screen individuals with intellectual disabilities for potential physical ailments and ensure the provision of pertinent medical attention. Furthermore, offering information and support for managing their physical health is of considerable significance.

Prospective investigations should focus on identifying the precise mechanisms underpinning the connection between intellectual disabilities and physical impairments. This pursuit holds the potential to pave the way for innovative interventions that can elevate the overall quality of life for individuals contending with these conditions.

6. Conclusion

In conclusion, this study has shown a clear association between intellectual disabilities and physical disabilities within the aforementioned three states in the U.S. As previously mentioned in the paper, additional research should concentrate on pinpointing these two disabilities and finding effective methods to improve the health conditions of individuals experiencing both intellectual and physical disabilities.

The findings unearthed through this study hold substantial promise for improving the welfare of individuals grappling with both intellectual and physical disabilities. It is crucial to perform

DOI: 10.54254/2753-8818/45/20240523

comprehensive assessments on those with intellectual and physical disabilities, ensuring they can access the necessary medical care. Furthermore, this exploration has underscored the need for further inquiries into the link between intellectual and physical impairments. Continued research on this topic will uphold its importance by augmenting community awareness concerning the origins and consequences of these co-occurring conditions. Such insights can then be leveraged to formulate interventions to enhance the overall quality of life for individuals within our community who confront these health challenges.

Acknowledgement

Kyubin Park and Eunseo Eo contribute equally to this research and should be considered as co-first authors. Kyubin Park, Eunseo Eo and Jihwan Lee's contributions were substantial, leading to their designation as co-first, co-first and second authors respectively. We affirm that there are no conflicts of interest among the authors regarding the paper publication.

References

[1] Physical disabilities. (n.d.). Kent County Council. Retrieved September 24, 2023, from https://www.kent.gov.uk/education-and-children/special-educational-needs/types-of-send/physical-disabilities

[2] Mary Ann Schaepper, M.D., M.Ed, DFAPA. (2021). Psychiatry.org - What is Intellectual Disability? American Psychiatric Association. Retrieved September 24, 2023, from https://www.psychiatry.org/patients-families/intellectual-disability/what-is-intellectual-disability

[3] Cooper et al. (2015, August 27). Multiple physical and mental health comorbidity in adults with intellectual disabilities: population-based cross-sectional analysis. NCBI. Retrieved September 24, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4551707/

[4] How To Get Disability For Traumatic Brain Injury (TBI). (n.d.). Riemer Hess. Retrieved September 24, 2023, from https://www.riemerhess.com/wiki/traumatic-brain-injury

[5] Causes and Risk Factors | NCBDDD. (2022). CDC. Retrieved September 24, 2023, from https://www.cdc.gov/ncbddd/developmentaldisabilities/causes-and-risk-factors.html

[6] An assessment of sex bias in neurodevelopmental disorders. (2015, August 27). NCBI. Retrieved August 25, 2023, from Cerebral Palsy. (2022, October 2). National Institute of Neurological Disorders and Stroke. Retrieved September 2, 2023, from https://www.ninds.nih.gov/health-information/disorders/cerebral-palsy

[7] Blaser et al. (n.d.). Why is Data on Disability so Hard to Collect and Understand? University of Washington. Retrieved August 25, 2023, from https://www.washington.edu/doit/sites/default/files/atoms/files/RESPECT_2020_DisabilityData.pdf

[8] Shandra, C. L. (2018, June 06). Disability as Inequality: Social Disparities, Health Disparities, and Participation in Daily Activities. Social Forces, 97(1), 157-192. https://academic.oup.com/sf/article-abstract/97/1/157/5033613

[9] Jacob, U. S., & Pillay, J. (2023, June 8). A systematic review of physical activity: benefits and needs for maintenance of quality of life among adults with intellectual disability. Frontiers. Retrieved September 24, 2023, from https://www.frontiersin.org/articles/10.3389/fspor.2023.1184946/full

[10] Leeuw, M. J. d. (2023, March 14). Associations between physical fitness and cardiovascular disease in older adults with intellectual disabilities: Results of the Healthy Ageing and Intellectual Disability study. Journal of Intellectual Disability Research, 67(6), 547-559. https://onlinelibrary.wiley.com/doi/full/10.1111/jir.13027

[11] Bartlo et al. (2011). Physical activity benefits and needs in adults with intellectual disabilities: systematic review of the literature. PubMed. Retrieved August 25, 2023, from https://pubmed.ncbi.nlm.nih.gov/21591845/

[12] Savage et al., (2023, May 9). Capabilities, Opportunities, and Motivation: Exploring Fitness Program Experiences of Adults with Intellectual and Developmental Disabilities. PubMed. Retrieved August 25, 2023, from https://pubmed.ncbi.nlm.nih.gov/37239499/

DOI: 10.54254/2753-8818/45/20240523

[13] Kansas State Department of Education. (n.d.). Multiple Disabilities Fact Sheet. KSDE. Retrieved September 25, 2023, from https://www.ksde.org/Portals/0/ECSETS/FactSheets/FactSheet-SpEd-MD.pdf

[14] Lalit, S. (2018, May 29). Meaning and Definition of Multiple Disabilities. WeCapable. Retrieved September 25, 2023, from https://wecapable.com/multiple-disabilities-meaning-definition-examples/

[15] Bindawas, S., & Vennu, V. (2018). The National and Regional Prevalence Rates of Disability, Type, of Disability and Severity in Saudi Arabia—Analysis of 2016 Demographic Survey Data. International Journal of Environmental Research and Public Health, 15(3), 419. MDPI AG. Retrieved from http://dx.doi.org/10.3390/ijerph15030419

[16] Zablotsky, B. (2017, November 29). Products - Data Briefs - Number 291 - November 2017. CDC. Retrieved September 8, 2023, from https://www.cdc.gov/nchs/products/databriefs/db291.htm

[17] Murtagh, K. N. (2004, August). Gender Differences in Physical Disability Among an Elderly Cohort. NCBI. Retrieved September 8, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1448463

[18] Bahk, J. (2019, July 20). The Life Expectancy Gap between Registered Disabled and Non-Disabled People in Korea from 2004 to 2017. NCBI. Retrieved September 8, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6678634/