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Bahaudin G Mujtaba
Nova Southeastern University
Huizenga College of Business
and Entrepreneurship
3301 College Avenue
Fort Lauderdale, FL. 33314-
7796, USA

Human resource analytics and adverse impact assessment based on gender: A study of academic performance and workplace disparities

Bahaudin G Mujtaba

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Abstract
Gender disparities in academic learning environments and in the workplace can be stressful and lead to dissatisfaction. This study investigates the impact of HR analytics education among graduate students based on gender. To assess for adverse impact in pass rates based on gender, a quantitative analysis of test scores from 113 graduate students revealed no significant differences between male and female students, indicating that the course materials and assessments were equitable and inclusive for all students. This paper provides a step-by-step process for educators and managers to assess their test outcomes for students or applicants to make sure there is no unintentional negative impact based on people's biological sex.
The findings suggest that HR analytics education can play a critical role in promoting fairness and inclusion in the workplace. The study's analysis process and results have important implications for legal experts, HR professionals, and managers in practice, highlighting the need for everyone to prioritize equity and inclusion by assessing test outcomes for any adverse impact based on protected categories. By doing so, organizations can keep their firms away from costly lawsuits, reduce employee stress, create a more positive and supportive work environment, and increase employee happiness. Suggestions and implications are provided.

Keywords: Disparate impact, human resource analytics, four-fifths rule, gender disparity, stress, happiness

Introduction

No modern leader or organization can be sustainably successful in today's global world without offering an inclusionary and healthy work environment for everyone in the workforce. Assessing the existence of an inclusionary and productive work environment requires getting accurate data, using it properly, and adopting to the recommended changes suggested by employees through periodic surveys using relevant metrics and analytics (Vargas, 2015). Such metrics and assessments must also be conducted on the internal procedures and criteria used to attract, hire, develop, and promote talent in the organization. This is where human resource departments and professionals can serve as strategic partners for organizational leaders to keep track of useful data and use it to predict trends, patterns and relationships while forecasting workforce needs for growth and succession planning in the years to come.

Human resource (HR) analytics is the process of collecting, analyzing, interpreting, and reporting people-related data for the purpose of improving decision making, achieving strategic objectives, and sustaining a competitive advantage in the industry (Bauer *et al*., 2024; Cascio & Boudreau, 2019) [6, 3]. HR analytics can be used for many purposes by managers and corporations, including for the goal of decreasing the chances of having a disparate or unintentional adverse impact on a protected group based on an employee assessment test or general hiring practice. In academia, HR analytics can be used to assess adverse impact by academic professors and administrators to make sure their students, regardless of their generational identity, gender, disability, religion, and ethnicity, are able to successfully achieve the requisite outcomes.

The use of HR analytics has become increasingly important in modern human resources management functions. By leveraging data and metrics, HR professionals can make

Corresponding Author:
Bahaudin G Mujtaba
Nova Southeastern University
Huizenga College of Business
and Entrepreneurship
3301 College Avenue
Fort Lauderdale, FL. 33314-
7796. USA

Informed decisions that drive business outcomes, improve employee experience, and reduce the risk of legal liabilities based on employment or promotional decisions. One key application of HR analytics is in the detection and prevention of disparate impact on employee promotion assessments and hiring practices related to the achievement of a certain score on tests. Disparate impact occurs when a seemingly neutral policy or practice disproportionately affects a particular group of individuals, often resulting in unintended discrimination (Cavico *et al*., 2017) [7, 8]. Disparate impact can have serious consequences for organizations, including legal liability, reputational damage, and decreased employee morale (Mujtaba). Moreover, disparate impact can lead to real or perceived inequity, causing stress and anxiety among employees who feel marginalized or excluded. By using HR analytics to analyze promotion and hiring practices, organizations can identify potential areas of disparate impact and take proactive steps to address them. This not only helps to reduce legal risks but also promotes a fairer and more pleasant work environment

(Mujtaba, 2023 / 2024) HR analytics can be used in various ways to decrease the disparate impact on employee promotion assessments and hiring practices. For example, analytics can be applied to identify predispositions in hiring processes, such as biases related to gender or ethnicity. Analytics can also be used to evaluate the effectiveness of teambuilding and inclusion initiatives, helping organizations refine their strategies and improve outcomes (Minenko and Mujtaba, 2024) [1, 7, 8, 15, 18]. Furthermore, HR analytics can provide insights into employee career development and progression, while enabling organizations to identify and address potential barriers to advancement. As can be seen from Figure 1, HR analytics can have many functions since its scope is widespread and it can be used methodically to understand the current situation (descriptive analytics), see patterns based on past trends (predictive analytics), assess the reasons for the current success or challenges (diagnostic analytics), and create a new process (prescriptive analytics) to make improvements.
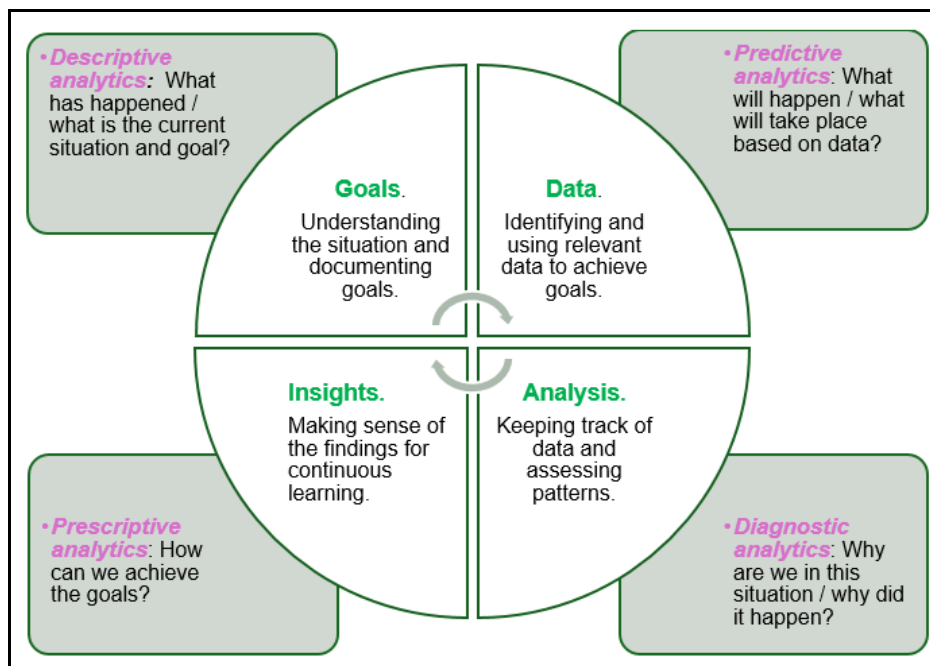
Source: created by the author

Fig 1: HR Analytic Functions and Process

By leveraging HR analytics to promote equity and fairness in employee assessments and hiring practices, organizations can create a more positive and inclusive work environment. This, in turn, can lead to increased employee happiness, engagement, and retention. When employees feel that they are treated fairly and have equal opportunities for advancement, they are more likely to be motivated, productive, and committed to the organization. By using HR analytics to drive equity and inclusion, organizations can reap these benefits while also reducing the risk of legal liabilities and reputational damage (Bauer *et al*., 2024) [3]. Many professionals today use data analytics to enhance their workforce satisfaction and happiness levels through teamwork and effective stress management. What stresses some workers is the unfair behaviors and management practices in today's work environments. As such, it is important to use data and evidence to monitor management practices at work while keeping the company away from

costly lawsuits. In this paper, the goal is to focus on gender challenges which often negatively impact females in the workplace.

Inequity of any kind, including those based on gender, can take an enormous toll on those who are directly impacted by it as well as those that are concerned about it since it can negatively influence teamwork, employee retention, productivity, and satisfaction. Inequity through adverse or disparate impact can lead to costly discrimination cases, unnecessary stress, unhappiness, and high employee turnover (Mujtaba, 2024) [1, 16, 24]. The awareness of such inequities can be a starting point, and its prevention the end goal.

Literature
It has been said that "While the words diversity, disparate impact, and discrimination are commonly read and heard by working adults and professionals, they can at times be

confusing and fearful to some managers" (Cavico *et al.*, 2017, p. 670) [8]. Despite the burdensome confusion and fears, experts recommend that all managers and HR professionals must become knowledgeable on these topics so they can align their policies with the Equal Employment Opportunity Commission (EEOC) expectations and civil rights laws. Accordingly, this research focuses on the disparate impact theory, and it relates to Title VII of the Civil Rights Act in the United States to prevent workplace discrimination. The disparate impact theory is applicable to claims dealing with many forms of discrimination such as sex, religion, ethnicity, disability, etc. in both public and private sector employment (Muffler *et al.*, 2010) [19]. Therefore, to create equity and prevent workplace stress, human resource professionals, managers and employees can protect themselves from illegal discriminatory practices by being aware of the discrepancy between a disparate impact case and a disparate treatment one with the latter requiring evidence of intentional discrimination (Mujtaba, 2025a) [20].

The HR function is a critical component of any modern organization, since these professionals are responsible for hiring, training, developing, and retaining one of the most valuable assets of any firm or institution, which is its people. HR's primary role has been to attract, develop, retain, and engage talent, while ensuring alignment with the organization's strategic goals and objectives and the prevailing laws in the local city, state or country. Effective HR practices, coupled with good management and caring leadership practices, foster a positive work environment, promote employee well-being, and drive long-term success for today's dynamic workplace (Mujtaba & Lawrence, 2024) [1, 16]. Using metrics and data, HR leaders handle various tasks such as recruitment, training, benefits administration, legal compliance, performance management, and conflict resolution.

Strategic leadership takes HR to the next level by aligning effective people management systems, design, and initiatives with organizational short- and long-term objectives. Strategic HR leaders contribute to organizational decision-making, leveraging their expertise to drive business outcomes. They focus on building capabilities, enhancing organizational culture, and developing leadership pipelines. By applying strategic thinking, HR leaders can help organizations adapt to changing market conditions, improve employee engagement, and increase competitiveness. Human resource management (HRM) departments must be used strategically and systematically to fairly and equitably manage an organization's human capital. Besides making sure there is legal compliance with local and national laws, HRM encompasses various additional practices, policies, and procedures to select, hire talent, develop, and train employees, retain and engage the entire workforce, manage performance and productivity, ensure employee well-being and safety, foster positive work culture and relationships, and align HR strategies with organizational goals.

Modern technologies, when integrated effectively in the organization's human resources information systems, offer benefits such as data-driven decision-making through HR analytics, streamlined recruitment processes with AI-powered tools, virtual training and development programs, automated performance management systems, enhanced employee experience through mobile apps, improved compliance with regulatory requirements, remote work management and flexibility, and better social media recruitment and employer branding (Mujtaba, 2025b) [21]. Human resource metrics and measurements, along with the implementation of such functions through proper technological competencies, are essential for evaluating the effectiveness of the organization's initiatives, while identifying areas for improvement in a timely manner for reactive as well as proactive strategic leadership decisions (Nafie *et al.*, 2025; Khanfar *et al.*, 2024) [16, 22, 23]. By tracking key HR metrics, managers and organizations can assess the impact of HR programs on weekly or monthly outcomes, such as revenue growth, customer satisfaction, and competitiveness. HR metrics also help organizations measure compliance with labor laws and regulations, thereby reducing anxiety, stress, and the risk of legal issues associated with lawsuits, negotiations, mediation, arbitration, and/or litigations (Mujtaba and Garner, 2024; Mujtaba and Fielder, 2024) [1, 16].

Stress is a common experience for men and women across the world, affecting people of all ages and backgrounds. Stress refers to a physical, emotional, or mental response to external pressures, demands, or challenges (Mujtaba and McCartney, 2010). While both eustress, good stress that motivates, and distress, negative or damaging stress, can be a natural part of life, its effects can vary greatly depending on its type, duration, and how well it is managed. Let us start by reflecting on gender disparities between men and women in the modern workplace and how it leads to unnecessary levels of stress, costly lawsuits, and unhappy employees.

Gender Disparity
Recognizing the connection of gender with other identity factors, such as race, ethnicity, and experience, is crucial. Understanding how these interconnecting identities influence workplace happiness can provide a more comprehensive picture of the challenges faced by different groups and generations (Mujtaba, 2023) [1, 18]. By delving into these dimensions, various factors may contribute to the ongoing discourse on workplace happiness, highlighting practical insights for organizations striving to create environments that support the well-being of all employees, irrespective of gender.

Women, historically underrepresented in certain professions, do face unique and stressful challenges that impact their happiness and job satisfaction (Rasool, 2021) [25]. On the other hand, proponents of gender equality argue that increasing diversity in the workplace enhances overall satisfaction by fostering varied perspectives and approaches. Stereotypes and biases may influence how men and women are perceived in professional settings, which can adversely affect opportunities for advancement and overall job satisfaction of some candidates (Siocon, 2023) [26]. Research suggests that men and women experience workplace happiness differently due to societal expectations, role perceptions, and organizational structures (Whitfield, 2023). Women often derive happiness from different aspects of their work than men, emphasizing the need for personalized approaches to employee well-being. Exploring the gender-specific challenges and opportunities related to career progression can provide valuable insights into the factors contributing to workplace happiness (Brakus *et al.*, 2022) [4]. According to Versere (2023) [27], women tend to portray less confidence during an employment interview process than men, which might lead to more male candidates being

chosen for the position and women dropping out of candidacy. Riccardi (2023) [28] states that women are less satisfied than men in the ability for a flexible work-life balance because of women's additional "society-imposed" responsibilities at home. For three consecutive years during the Covid-19 pandemic, women did not receive the flexibility, supportive policies, and time off options needed to meet their childcare and other such personal obligations (Riccardi, 2023) [28].

Today's men and women across the globe face many personal and professional ethical dilemmas that can be taxing (Mujtaba *et al*. 2025). Luckily, most professionals learn to manage some of the daily stresses effectively through better cross-cultural communications (Langaas and Mujtaba, 2023) [15, 18]. A survey of Chinese physicians showed no significant differences in male or female satisfaction rates, but a study in Europe found that females were more satisfied in the workplace than men (Redmond and McGuinness, 2019) [29]. A study in Britain and another in the European countries in 2007 also showed women were more satisfied in the workplace. Redmond and McGuinness (2019) [29] attribute satisfaction to lower expectations by women in the workplace.

In the U.S., women have been found to place more weight on work-life balance and flexibility than men (Redmond and McGuinness, 2019) [29], which might be costing them in terms of compensation (Mujtaba and Fielder, 2024) [1, 16]. American women were paid eighty-three cents for every dollar made by their male colleagues during 2014 (Bauer *et al*., 2024) [3]. Fast forward to about a decade later in 2023, the U.S. Department of Labor (2023) reports that women make 83.7% of what men make, roughly $10,000.00 less each year. Due to the availability of transparent data on salaries and remote work options across industries, women are now expecting more flexibility and are less satisfied with rigid in-office policies as they want to maintain a balance with personal obligations. When such expectations are not met or managed in a timely manner, it can cause acute and chronic forms of stress.

Acute and Chronic Stress
Stress is a psychological and physiological response to perceived challenges or threats (Mujtaba and McCartney, 2010). When an individual feels threatened or is unable to cope with certain demands that appear beyond one's capabilities, the body responds with a variety of reactions designed to protect it. This can include the release of hormones such as adrenaline and cortisol, which help the body prepare for a "fight or flight" response. Stress can be categorized as either acute or chronic, with each type having distinct causes and consequences (American Psychological Association, 2020) [2]. Acute stress is short-term and often results from specific events, such as a work deadline or a traffic jam during rush hour. Chronic stress, on the other hand, is prolonged and persistent, often resulting from ongoing issues such as job insecurity, unfair work environment, financial struggles, or long-term health concerns.

Acute stress is the most common and typically occurs in response to specific, time-limited events. Just like eustress, it can be manageable and even motivating in small doses, helping individuals focus and perform well in high-pressure situations and deadlines. However, prolonged acute stress can lead to job burnout and serious health problems, if left

unmanaged (Sapolsky, 2004) [30]. Chronic stress is usually more pervasive and long-lasting. This type of stress often results from ongoing situations that feel inescapable, such as working with powerful bullies, living in poverty, or being in an abusive relationship. Unlike acute stress, chronic stress can have severe consequences on both mental and physical health, leading to conditions such as debilitating anxiety, depression, heart disease, or even a weakened immune system (Lupien *et al*., 2000) [31].

Episodic acute stress generally refers to a repeated experience of acute stress and its victims can find themselves in a cycle of crises or dramatic life events. People's inability to manage stress effectively or in a timely manner results in frequent and intense episodes of anxiety and tension, making it difficult to regain emotional balance (McEwen, 2006) [32]. The effects of stress on physical and mental health can be profound. On a physiological level, stress triggers the release of cortisol, a hormone that can increase blood pressure, suppress immune function, and contribute to the development of chronic conditions such as heart disease, obesity, and diabetes (Sapolsky, 2004) [30]. Chronic stress can also lead to mental health disorders like anxiety and depression, as individuals may feel overwhelmed by the constant strain of managing stressors without relief (Kendrick *et al*., 2023) [33]. Research has shown that the body's response to chronic stress can lead to increased inflammation, which is linked to serious health problems, including cardiovascular diseases and autoimmune disorders (McEwen, 2002) [34]. Additionally, prolonged stress can impair memory and cognitive function, as the brain's ability to process information becomes compromised by the constant activation of stress hormones (Lupien *et al*., 2000) [31].

On the psychological side, stress can contribute to emotional distress, reduce coping ability, and diminish quality of life. People under chronic stress may find it difficult to manage their emotions, which can strain relationships and contribute to social isolation. In some cases, individuals may resort to unhealthy coping mechanisms, such as overeating, smoking, or excessive alcohol consumption, further exacerbating the negative health effects of stress (Kabat-Zinn, 2003) [14].

Job stress influences behavior in the workplace, often manifesting in ways that undermine productivity of individuals and teams, which contribute to counterproductive outcomes such as tardiness, absenteeism, substance misuse, and inappropriate workplace interactions (Mukherjee, 2024) [35]. Additionally, stress can strain interpersonal relationships, thereby increasing the likelihood of conflicts, incivility, harassment, poor communication, and creating a toxic work environment (Raza *et al*., 2024) [36]. The stresses of incivility or pressuring political-based behaviors not only hinder individual performance but also disrupt team dynamics and organizational effectiveness (Noori *et al*., 2023) [37].

Gender-based Stress
Stress has a profound effect on both men and women in the workplace, often manifesting in ways that can harm one's mental health, productivity, and relationships with colleagues. Societal expectations play a significant role, as many men feel pressured to conform to traditional views of masculinity, such as being strong and resilient (Men's Mental Health in the Workplace, 2023) [38]. This expectation can discourage some men from expressing emotions or

seeking help, leading to suppressed feelings and worsening stress levels. Over time, this can result in burnout, anxiety, depression, and other mental health issues. One major factor contributing to stress among men is job-related pressure, including long hours, high expectations, and the fear of underperformance (Men's Mental Health in the Workplace, 2023) [38]. The competitive nature of some work environments can exacerbate these issues, causing men to prioritize work over self-care. This imbalance can lead to physical health problems, such as high blood pressure and sleep disturbances, further intensifying stress. Additionally, stress-related distractions can impair concentration, decision-making, and problem-solving abilities, diminishing overall job performance. Another critical issue is the stigma surrounding mental health in the workplace. Some men hesitate to admit they are struggling, fearing it may be perceived as a sign of weakness or harm to their professional reputation (Mujtaba and McCartney, 2010). This reluctance to seek support or utilize mental health resources delays intervention and can prolong suffering. Employers, therefore, play a vital role in breaking this cycle by fostering an environment where mental health is openly discussed and normalized.

Workplace stress can disproportionately affect modern women, often due to a combination of organizational, societal, and gender-specific factors which often appear like a "glass ceiling" that females can see through but cannot always break through (Uru *et al*., 2024) [39]. Women experience stress in the workplace often due to the dual pressures of balancing professional responsibilities with family or caregiving roles, known as the "second shift" (Hochschild & Machung, 2012) [40]. It should be noted that women tend to report higher levels of stress related to job insecurity, unequal pay, and limited opportunities for career advancement compared to their male counterparts (Kohn, 2020) [17]. Women are more likely to experience workplace discrimination, including gender-based microaggressions and biases, which can contribute to feelings of isolation, underappreciation, and burnout (Shin, 2019) [42]. Women face higher expectations for emotional labor in their roles, especially in service-oriented professions, which can increase the emotional strain and physical stress they experience on the job (Brotheridge & Lee, 2003) [43]. Since "sunlight" can be a natural disinfectant, all organizations should "shine light" on the presence of both blatant and subtle forms of gender inequity in society. In addition, much coaching, mentoring, and inclusionary affirmative action type of encouraging work needs to be done to create a level playing field for women in our male-dominated society.

Creating a supportive workplace culture can mitigate stress for men and women. Companies can implement programs promoting mental health awareness, such as stress management workshops, counseling services, or flexible work policies. Encouraging open communication and showing empathy can help employees feel valued and understood. For modern employees, knowing that their workplace supports mental well-being can make it easier to address stress and achieve a healthier work-life balance for everyone based on their unique individual needs.

Understanding the ways in which men and women experience and perceive workplace happiness is essential for fostering inclusive and equitable work environments (Warren *et al*., 2019) [44]. The workplace is not a gender-neutral space, and various societal and organizational factors can contribute to different experiences of happiness between men and women. Workplace happiness is a crucial aspect of employee well-being and organizational success. So, it is essential to focus on gender equity and workplace happiness. The dynamics of the workplace have undergone significant transformations, with a growing emphasis on happiness, equity and inclusion (Warren *et al*., 2019) [44]. However, amidst this pursuit, gender disparities in workplace happiness have emerged as a critical area of concern, especially for women as they may be discriminated against purposely or unintentionally.

Disparate Impact

Disparate treatment (also known as "intentional discrimination") exists when individuals in similar situations are treated differently based upon sex, race, color, religion, national origin, age, or disability status (Muffler *et al*., 2010; Mujtaba, 2025a) [19, 21]. Whenever individuals are treated differently because of their race, sex, or the like, and there is an actual intent to treat them differently; the plaintiff must prove that there was a discriminatory motive-that is, that the employer intended to discriminate (Mujtaba, 2024) [1, 16]. Organizations often proactively defend themselves against disparate treatment or intentional discrimination claims by showing there was a non-discriminatory job-relatedness reason for the adverse action against the applicant or employee (Cavico *et al*., 2017) [8]. In other words, an organization must defend its practices using the business necessity criteria. Under the bona fide occupational qualification (BFOQ) theory, a protected characteristic is an essential quality of the job and employers must demonstrate discrimination is job related; in other words, employers must make sure their employment practice is based on a legal form of discrimination. In general, the BFOQ or business necessity defense means that using the procedure which caused an adverse impact, is vital for the survival of the operation since there are no substitute measures that are equally efficient with less disparate impact (Mujtaba, 2025a) [21].

Disparate impact occurs when a facially neutral employment practice disproportionately excludes a protected group from employment or promotional opportunities (Cavico and Mujtaba, 2020) [7]. In other words, either adverse, unintentional, or disparate impact occurs when a hiring, selection process, or promotional practice *disproportionately* excludes a protected group from the achievement of such opportunities. As per the laws in the United State, adverse or disparate impact based on a person's gender or other such protected categories, even when it is unintentional, is illegal.

In a disparate impact case, according to Cavico and colleagues (2017, p. 670) [8], "there is no intentional discrimination, and as such proof of discriminatory intent is not required"; however, "the employee has to present evidence that the employer's neutral on-its-face employment policy or practice caused an adverse disproportionate impact on the employee as a member of a protected class." HR professionals and managers must be prepared to show how specific requirements related to knowledge, skills, education, training, backgrounds, as well as height, weight, strength, and dexterity are legitimate qualifications that directly relate to successful job performance (Cavico *et al*., 2017; Morse and Mujtaba, 2008) [8].

Generally, there are two types of analysis used to determine disparate impact, the four-fifths rule or the standard deviation rule which can be done through Chi-Square Test of Independence (Mujtaba, 2022). In the four-fifths rule, a test has a disparate impact if the hiring rate for the minority group is less than four-fifths (80%) of the hiring rate for the majority group. The standard deviation rule uses actual probability distributions to determine adverse impact. The four-fifths rule is a guideline generally accepted by the American courts and the Equal Employment Opportunity Commission for making a primary case of disparate impact by showing that an employment practice results in members of a protected class being treated less favorably by an employment practice than members of a non-protected class (GreggU, 2016) [45]. For "*the four-fifths rule*" (the 80% rule), one can follow a linear process to assess if an adverse impact exists using a test score outcome based on a protected category such as sex, age, religion, ethnicity, etc. (Caughlin, 2020; GreggU, 2016; Mujtaba, 2022) [45, 46]. More specially, we can use the following steps to assess the presence of disparate impact from a test on a protected group, such as women:

1. Identify the test, policy or practice being applied to make "pass or fail" employment decisions.
2. Calculate the pass rate (or selection rate) for each group.
3. Identify which group has the highest pass rate (or selection rate).
4. Calculate adverse impact ratios.
5. Determine if adverse or unintentional impact exists.

Methodology
To assess if a disparate impact exists between the scores of males and females, we can initially use the four-fifths rule, which claims that a test has a disparate impact if the pass rate for the minority group is less than four-fifths (80%) of the pass rate for the majority group (2025a). In this study, we can assess if course assignments and tests have a disparate impact based on gender. Given the diversity of assignments in a course, are male and female students able to achieve similar scores? Or could there be a disparate

impact based on gender?
Using a convenience sampling methodology, the population of this study are graduate students who completed the "*HR Analytics*" course as part of the requirement for the Master of Science in Human Resource Management degree in the South Florida region of the United States during 2022 to 2024. The total data is the combination of students who successfully completed the course in three separate terms, using the same assignments and exams, facilitated by the same professor. Since one professor taught the course using the same exact topics, lectures, and exams, one can assume a high level of objectivity in the assessment process. Students were graded based on weekly online discussion forum posts, participation in the synchronized lectures, completing a proctored mid-term exam, completing a research paper using HR analytics, and completing a problem-based final exam using data provided in Excel. Students' earned grades were totaled for all assignments to see if there is a disparate impact based on gender at a score of 90%. The research assesses whether there is a disparate impact based on gender in students' scores. In other words, *given the diversity of assignments in the "HR Analytics" course, are male and female students able to achieve similar scores?*
In the sample of males and female in the "HR Analytics" course, a total of 113 students successfully completed the course, with 90 females and 23 males. Most were working adults (108) in the field of human resources, with 8 reporting that they are full-time students.

The Four-Fifths Rule Analysis
As shown in Figure 2, using a 90% achievement level or pass rate, 71 women (79% rate) and 19 men passed (83% pass rate). In this sample, men have the highest pass rate at 83%; so, to calculate the adverse impact ratio using the four-fifths rule, we can divide the pass rate for women by the rate for men (0.79 / 0.83) to get an impact ratio of 95% for females. Since the adverse impact ratio on female pass rate is 95%, higher than 80%, there is no evidence of adverse impact or unintentional discrimination.
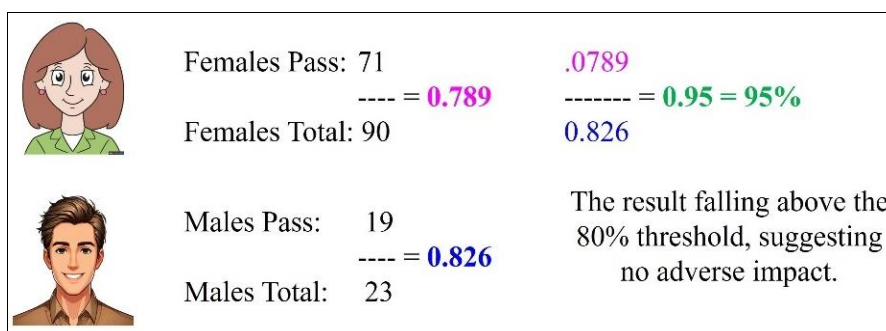
Fig 2: The Four-Fifth Rule Summary

The Chi-Square Test of Independence Analysis
For additional analysis, we can apply the chi-square test of independence to assess if there is a disparate impact on a protected group using Microsoft Excel. We have already queried the frequencies/counts of men and women who passed or failed a test at the 90% cut off level used for pass rate (or a promotion). As such, with the available data, we are ready to apply the chi-square test of independence to assess whether there is prima facie evidence of disparate

impact or intentional discrimination.
Using the Excel workbook, we can create a 2 x 2 table with the observed pass/fail frequency/count data for men and women (Table 1). We can begin by calculating the row and column marginals, which simply means that we will calculate the sums for the number of men, women, individuals who passed, and those who failed to achieve an overall score of 90%.

Next, we can create a blank table titled expected data that we can use to calculate the frequencies/counts we would expect if the variables for gender (men, women) and outcome (pass, fail) were independent of one another, or unrelated (Table 2). To calculate the expected frequency/count for men who passed the knowledge test, multiply the row and column marginals that align with the cell for men who passed, and divide the product by the overall sample size.

Table 1: Observed Data

	Pass	Fail	Total
Men	19	4	23
Women	71	19	90
TOTAL	90	23	113

Table 2: Expected Data

	Pass	Fail	Total
Men	18.319	4.681	23
Women	71.681	18.318	90
TOTAL	90	23	113
	p-value - 0.69		

With our observed and expected data tables complete, we are now ready to assess whether the observed data are significantly different than the data we would expect if the gender and outcome variables were not associated with one another. In other words, we are determining whether we should reject the hypothesis that the observed and expected data are the same. To do so, we will calculate a *p*-value associated with a chi-square test of independence. There are different ways to calculate a *p*-value in Excel, and the simplest is to use the CHISQ.TEST function (Bauer *et al.*, 2024; Mujtaba, 2025a) [3, 20]. As the first argument in the function's parentheses, we enter the array/range of cells that contain the raw data of men and women who passed or failed in the observed data table. Finally, we can enter the array/range of cells that contain the raw data of men and

women who passed or failed in the expected data table.
The resulting *p*-value is 0.69, which falls above the conventional cutoff value or alpha level of .05. Thus, we fail to reject the hypothesis that the observed and expected data are the same; so, we conclude that there is no evidence that the gender and test outcome variables are significantly associated with one another. In other words, we conclude the there is *no* evidence of a gender effect on knowledge assessment or total scores of male and female students; so, a disparate impact does not seem to be present based on the cumulative scores.
If the *p*-value was less than .05, we would have concluded That the relationship between the two variables is statistically significant. After that, we would have to look at the observed data table to determine which gender (men or women) has a disproportionately higher selection rate based on the test outcome (Mujtaba, 2025a; Bauer *et al.*, 2024) [3, 20]. That is, we would compare the proportion of men who passed relative to the proportion of women who passed. We would only make such comparisons when we find a statistically significant effect.

The T-Test Analysis
We can also assess outcomes based on average or mean scores achieved by the two different groups (male and females). Using Excel, we can apply an independent-samples *t*-test to evaluate the effectiveness of the assignments based on male and female achievement outcomes. For the purposes of this analysis, we are concerned about the students' scores and want to see if there are gender disparities in their achievements. After both groups complete the assignments, we assess their overall knowledge based on their cumulative scores in the course (or a specific test). The analysis can be done using an independent sample *t*-test to evaluate whether the mean score for participants is significantly different based on gender.

Table 3. Test: Two Sample Equal Variances

	Males	Females
Mean	93.422	92.949
Variance	21.205	40.004
Observations	23.000	90.000
Pooled Variance	36.278	
Hypothesized Mean Difference	.000	
df	111.000	
t Stat	.336	
P(T<=t) one-tail	.369	
t Critical one-tail	1.659	
P(T<=t) two-tail	.737	
t Critical two-tail	1.982	

As shown in Table 3, based on the actual mean scores of 93.4 for men and 92.9 for women, despite the larger variance for females, the overall *p*-value of 0.737 shows no statistically significant difference between the two groups in this study. In other words, male and female students seem to have equal opportunities to do well in this course. The Diversity of assignments does not appear to result in any disparate or adverse impact based on gender.

Discussion: The different methods of analysis in this study revealed no statistically significant difference in test scores

between male and female students in the "HR analytics" course, suggesting that the course materials and assessments did not disproportionately affect one gender over the other. This finding is encouraging, as it indicates that the course is likely to be equitable and inclusive for all students, regardless of gender. Furthermore, the lack of disparate impact suggests that the course is effectively teaching HR analytics concepts to both male and female students, which is essential for promoting equity and inclusion in the field of human resources.
The absence of disparate impact in the course is also

noteworthy given the historical underrepresentation of women in the science, technology, engineering, and mathematics (STEM) fields, including analytics. The fact that female students in this course performed equally well as their male counterparts suggests that the course is helping to bridge the gender gap in analytics. This finding has important implications for education and management practices, as it highlights the importance of creating inclusive and equitable learning environments that support the development of diverse talent in analytics. By promoting diversity and inclusion in analytics using traditional and innovative technologies like digital twinning and even robotics, we can help to drive more equitable, healthier, and effective management practices in organizations locally, nationally, and globally (Nafei *et al*., 2024; Khanfar *et al*., 2024) [16, 23].

Implications
The implication of no discrimination based on gender can have positive impacts on employee stress and happiness. When employees perceive that they are being treated fairly and have equal opportunities for growth and development, they are less likely to experience stress and anxiety related to perceived inequities. In contrast, when employees perceive that they are being unfairly treated or excluded from opportunities, they are more likely to experience increased stress levels, decreased job satisfaction, and lower overall well-being (Mujtaba, 2025a) [20]. By promoting equity and inclusion in a department or culture, modern leaders and agile organizations can help to reduce employee stress and promote a more positive and supportive work environment throughout the value chain using creative and innovative leadership practices (Aaman *et al*., 2024; Subramaniam *et al*., 2023) [1].

The finding of no disparate impact also has implications for employee happiness. When employees feel that they are being treated fairly and have opportunities to develop their skills and knowledge, they are more likely to experience increased job satisfaction, engagement, and overall happiness. In contrast, when employees perceive that they are being unfairly treated or excluded from opportunities, they are more likely to experience decreased job satisfaction, disengagement, and lower overall well-being. By promoting equity in employment decisions, organizations can help to increase employee happiness, retention, and overall success. This, in turn, can drive business outcomes, such as increased productivity, creativity, and innovation.

Recommendations
It is a given that job satisfaction levels within the organization and job engagement levels are predictive of the overall turnover rate (Bauer *et al*., 2024) [3]. Additionally, research has shown that happier employees are about 12% more productive than their unhappy counterparts ("Happy Employee Statistics and Facts," 2023, para 3) [12]. When male and female employees are welcomed and engaged at work; they are willing to take on additional projects to ensure all organizational goals are achieved efficiently in a timely manner. Overall team performance will enhance the organization's profitability in the marketplace. Employee happiness can influence career satisfaction and progression, potentially reducing barriers to advancement for both men and women.

The happiness of individuals at work can be influenced by several factors, including gender and racially equitable practices. Organizations that demonstrate cultural sensitivity and awareness contribute to a more inclusive workplace where individuals of different genders, races, and generations feel respected and understood. Each organization should establish clear policies against intentional and unintentional discrimination based on gender or other protected categories to help create a safe and supportive environment, which enhances happiness at work. Establishing mentorship programs and support networks that address the unique challenges faced by individuals of different genders can positively impact employee happiness within the workplace. Companies should use survey data throughout the year to "keep their finger on the pulse of the firm's workforce," to obtain employee feedback, and to be proactive about any critical concerns within the company. This will result in open communication between management and employees of any gender or generation within the organization.

Gender diverse and happier teams are often more innovative bringing a range of perspectives that can lead to creative problem-solving and better decision making. The gender-inclusive environment can attract top talent, foster positive employee relations, and enhance the loyalty of employees to be committed to the organization. Addressing the specific needs and concerns of different genders is critical for promoting a successful workplace that benefit both the individuals and the organization.

Women often experience greater workplace stress due to the dual burden of work and caregiving responsibilities (Cifre *et al*., 2015) [9]. Offering flexibility empowers employees to create a work-life balance tailored to their needs, thereby alleviating debilitating acute or chronic forms of stress. Additionally, cross-cultural training emphasizes the importance of understanding and addressing diverse workplace needs (Langaas and Mujtaba, 2023) [18]. Flexibility of hybrid or remote work in scheduling and location can help individuals adapt to cultural differences and mitigate the stress associated with rigid workplace expectations.

Ornek and Esin (2020) found that women participating in a mental health promotion program experienced a measurable decline in stress levels and developed more effective coping strategies. Enhanced communication and the capacity to foresee cultural subtleties also bolster employees' confidence and reduce anxiety when engaging with colleagues or clients from diverse backgrounds (Langaas and Mujtaba, 2023) [18]. By fostering open communication and shared learning, cross-cultural training not only increases collaboration but also supports employee well-being, contributing to a more inclusive and peaceful workplace.

Recognizing and celebrating employees' achievements is a simple yet impactful way to reduce workplace stress and foster a positive work culture. Celebrating success can bridge gender disparities in workplace recognition. Some women may feel overlooked in professional settings, which exacerbates stress and undermines well-being (Cifre *et al*., 2015) [9]. Employers can address this by implementing equitable recognition practices that highlight the contributions of all employees, thereby promoting a sense of belonging while reducing burdensome stress.

To maximize the impact of positive and inclusionary

initiatives, organizations should adopt an integrated approach that combines flexibility, support services, and recognition. By adopting gender-specific strategies, organizations can effectively reduce workplace stress and foster a healthier, more productive environment for everyone. Overall, providing meaningful work, an inclusive environment with equitable policies, and growth opportunities for all is a crucial part of employee happiness for men and women alike. Organizations need to cultivate a happy and inclusionary workplace environment for their employees because it can boost productivity, retention, organizational culture, morale, and job satisfaction.

Conclusion
The analysis of cumulative scores in the HR analytics course revealed no disparate or adverse impact between male and female students' test scores, indicating that the course materials and assessments were equitable and inclusive for everyone. This finding has important implications for practice, as it highlights the importance of creating inclusive and equitable work environments that support the development of diverse talents in modern organizations. The absence of disparate impact can have a positive impact on employee stress management protocols and overall happiness. By promoting equity and inclusion in the workplace, organizations can help to reduce employee stress, promote a more positive and supportive work environment, and increase employee happiness, retention, and overall success. This, in turn, can lead to positive outcomes, such as increased productivity, creativity, and innovation.

Workplace stress is a multifaceted issue that affects employees across all demographics, with notable variations in experiences between men and women. While some men often struggle with societal expectations around masculinity and reluctance to seek support, women face challenges like balancing professional and caregiving responsibilities and encountering workplace inequities resulting from prejudiced decisions. By integrating practical and gender-focused strategies, organizations can enhance employee well-being, improve productivity, and cultivate a merit-based workplace culture that values fairness and equity for all. Future research should explore more nuanced stress management practices to further close gender disparities and adapt to evolving workplace landscapes.

Overall, despite a small sample population, the findings of this study underscore the importance of periodic assessment, equity, and inclusionary teaching and management practices in this modern twenty-first century work environment. By prioritizing equity in all employment decisions, organizations can create a more positive and supportive work environment, reduce stress, and increase employee happiness. As the field of HR analytics continues to evolve, it is essential that educators and practitioners prioritize equitable and inclusionary practices to remove any adverse impact on protected groups and ensure everyone has equal opportunities to succeed.

Compliance with Ethical Standards
1. Conflict of Interest: There are no conflicts of interest between the author, sample population, and/or journal editors.
2. Informed consent: Not applicable for the study.
3. Funding information: This study was self-funded.
4. Ethical approval: The research followed proper institutional research protocols.
5. Data availability. Data can be requested from the first author.
6. Acknowledgement**.** AI was used to improve the language content, after which the author(s) checked the text and took full responsibility for its content.

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