

Unsupervised Clustering of Intimate Partner Violence Typologies: Analyzing Communication Deviance, Attachment Anxiety, and Trait Impulsivity via Machine Learning

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ABSTRACT

Objective: This study aimed to identify distinct typologies of intimate partner violence (IPV) risk by analyzing the interplay of communication deviance, attachment anxiety, and trait impulsivity using unsupervised machine learning within a community sample.

Methods and Materials: A cross-sectional quantitative design was utilized with a sample of $N = 482$ individuals from heterosexual couples in Poland. Data were collected via online self-report measures, including the Revised Conflict Tactics Scales (CTS2), the Communication Deviance Scale, the Experiences in Close Relationships-Revised (ECR-R) for attachment anxiety, and the Barratt Impulsiveness Scale (BIS-11). A k-means clustering algorithm was applied to the standardized psychological variables to derive typologies, which were subsequently profiled and validated against IPV severity using one-way ANOVAs.

Findings: The k-means algorithm yielded a robust three-cluster solution. Cluster 1, the “Regulated/Secure” group ($n = 210$, 43.6%), exhibited low scores across all three risk factors and reported minimal IPV. Cluster 2, the “Anxious-Impulsive” group ($n = 165$, 34.2%), displayed elevated attachment anxiety and trait impulsivity alongside moderate communication deviance, corresponding to significantly higher rates of psychological and physical aggression. Cluster 3, the “Dysregulated/Deviant” group ($n = 107$, 22.2%), demonstrated the highest scores across all three psychological constructs and reported the most severe, multifaceted IPV, including significantly elevated levels of sexual coercion and physical injury.

Conclusion: The identification of these distinct psychological risk profiles highlights the fundamental heterogeneity of IPV perpetration and underscores the critical necessity for tailored, person-centered screening and intervention strategies.

Keywords: Intimate Partner Violence, Typologies, Communication Deviance, Attachment Anxiety, Trait Impulsivity.

1. Introduction

Intimate partner violence (IPV) represents a pervasive and devastating global public health crisis and a fundamental violation of human rights. It encompasses a spectrum of behaviors—including physical, sexual, and psychological abuse, as well as controlling behaviors—perpetrated by a current or former intimate partner (Hegarty et al., 2023). The global prevalence of IPV is staggering, with systematic reviews and meta-analyses indicating that a significant percentage of women worldwide experience some form of violence from an intimate partner in their lifetime (White et al., 2023). This issue transcends geographical, cultural, and socioeconomic boundaries, with extensive research documenting its presence in diverse national contexts, from Sub-Saharan Africa (Ani, 2025; Seifu et al., 2024), including specific studies in Ghana (Atta et al., 2025), Cameroon (Amoak et al., 2025), South Africa (Malesa, 2023; Pengpid & Peltzer, 2024), Ethiopia (Yirgu et al., 2023), Uganda (Kadengye et al., 2023), and Tanzania (Mosha et al., 2023), to Asia, with reports from Malaysia (Nudin & Mohamed, 2023), Myanmar (Win, 2025), and China (Fan & Kim, 2024). Similarly, research highlights the problem in the Middle East and North Africa, including Jordan (Urquhart et al., 2023), Tunisia (Guermazi et al., 2024), Saudi Arabia (Alqurashi et al., 2025), and Iran (Maharlouei et al., 2023), as well as in the Americas, with data from Mexico (Cénat et al., 2024) and Brazil (Baumont et al., 2024), and across Europe, including Germany (Jud et al., 2023), Poland (Sójta et al., 2023), and Türkiye (Nur, 2023).

The consequences of IPV are profound and far-reaching, extending across the entire life course (Hegarty et al., 2023). Victims endure a heightened risk of physical injury, chronic pain, and long-term health complications. The psychological toll is equally severe, manifesting as an increased incidence of depression, anxiety disorders, post-traumatic stress disorder (PTSD), and suicidal ideation and attempts (Lisi et al., 2023; Nur, 2023; Ortega Ceballos et al., 2023; Park et al., 2025; White et al., 2023). Exposure to IPV is particularly detrimental during vulnerable periods such as pregnancy, where it is linked to adverse maternal and neonatal outcomes and poor maternal psychological wellbeing postpartum (Ahmed et al., 2024; Fan & Kim, 2024; Maharlouei et al., 2023; Woofter et al., 2024). Moreover, the experience of IPV can be compounded by societal and structural factors, such as those exacerbated during the COVID-19 pandemic, which saw a documented rise in violence and associated

socioeconomic stress (Baumont et al., 2024; Landfield et al., 2023; Reed et al., 2025). The violence also impacts broader family systems, with clear associations between IPV and other forms of family violence like child maltreatment (Lee et al., 2023). Despite its prevalence, understanding the complex reasons why victims may remain in abusive relationships is critical, as these decisions are often influenced by a variety of powerful personal and structural factors (Seeletse, 2024). The issue is not confined to heterosexual relationships; sexual and gender minority (SGM) individuals also face significant rates of IPV, often compounded by unique stressors and barriers to support (Galdámez-Vázquez & Hernández-Gordillo, 2024; Leat et al., 2023; Sarno et al., 2023; Scott et al., 2023; Whitton et al., 2023).

Given the complexity and heterogeneity of IPV, a significant limitation in the field has been the tendency to treat violent relationships as a monolithic phenomenon. This “one-size-fits-all” approach fails to capture the vast differences in the patterns, severity, motivations, and underlying psychological dynamics of abusive relationships (Gottfredson & Nielsen, 2024). Consequently, prevention and intervention efforts that do not account for this variability may be sub-optimally effective or, in some cases, inappropriate for certain subgroups (Lalande et al., 2023; Mootz et al., 2024). This recognition has spurred a move toward typological research, which seeks to identify distinct, empirically-derived subgroups of individuals who perpetrate violence or dyads experiencing violence. The creation of such typologies allows for a more nuanced understanding of the etiological pathways to violence and provides a critical foundation for developing tailored interventions that can target the specific risk factors and needs of different subgroups (Roy et al., 2023). Early typological work has been foundational, but often relied on forensic or clinical samples, which may not be generalizable to the broader population where much of IPV occurs. To advance the field, there is a pressing need to explore these typologies within community samples, focusing on the interplay of key psychological characteristics that predispose individuals to conflict and aggression.

To address this gap, this study focuses on three well-established yet complex psychological constructs implicated in relational dysfunction and violence: trait impulsivity, attachment anxiety, and communication deviance. Trait impulsivity, characterized by a tendency to act on rashly conceived behavioral urges with little to no forethought about potential consequences, is a robust predictor of

aggressive behavior (Neilson et al., 2023). From the perspective of modern control theory, individuals with low self-control are more likely to resort to immediate, forceful, and often violent solutions to interpersonal problems rather than engaging in more considered, long-term strategies (Gottfredson & Nielsen, 2024). This construct is a core feature of personality disorders such as antisocial and borderline personality, which themselves are strongly linked to IPV perpetration (Taşkale et al., 2024). Research consistently demonstrates that higher levels of impulsivity are associated with a greater likelihood and frequency of physical and psychological aggression toward a partner (Cunha et al., 2024). Impulsive individuals may struggle with emotion regulation, leading to rapid escalation in conflict situations and an inability to de-escalate once aroused, turning minor disagreements into episodes of severe violence (Simpson et al., 2024).

A second crucial dimension is adult attachment insecurity, specifically attachment anxiety. Rooted in early life experiences, attachment styles shape an individual's internal working models of self and others, profoundly influencing how they perceive, interpret, and behave in close relationships (Brunton & Dryer, 2024). Individuals high in attachment anxiety live with a chronic fear of abandonment and rejection, leading them to be hypervigilant to signs of partner disinterest or withdrawal. This hypervigilance can fuel intense emotional distress, jealousy, and a desperate need for reassurance. When these needs are not met, or when a threat to the relationship is perceived, individuals with an anxious attachment style may employ maladaptive "hyper-activating" strategies to regain proximity and security, which can include controlling behaviors, guilt-induction, and psychological and physical aggression (Sójta et al., 2023). These behaviors, while aimed at preserving the relationship, paradoxically create the instability and conflict that the individual fears. The emotional dysregulation inherent in attachment anxiety is a key mechanism linking this trait to IPV, as the inability to manage intense negative affect during relational stress can precipitate aggressive outbursts (Taccini et al., 2024). The psychological impact of childhood abuse can be a significant precursor to developing such insecure attachment patterns in adulthood, creating a developmental pathway to subsequent IPV victimization or perpetration (Nudin & Mohamed, 2023).

The third critical construct, communication deviance, refers to a style of interpersonal communication that is vague, fragmented, illogical, and difficult to follow. Within an intimate dyad, deviant communication patterns create a

chronically confusing and frustrating environment where mutual understanding is perpetually undermined (Alqurashi et al., 2025; Grocott et al., 2024). Partners are unable to clearly express their needs, effectively resolve conflicts, or provide coherent support, leading to a build-up of unresolved grievances and negative sentiment. This communication breakdown is a potent catalyst for conflict escalation. When attempts at constructive dialogue fail, partners may resort to more primitive and coercive methods of influence, including psychological aggression (e.g., yelling, insults) and physical violence, simply to be heard or to terminate the aversive interaction. In some contexts, this breakdown is exacerbated by alexithymia—a difficulty in identifying and describing one's own emotions—which further impedes emotional expression and understanding, thereby increasing the risk of violence (Dubé et al., 2024; Guermazi et al., 2024). In essence, communication deviance erodes the foundational processes of a healthy relationship, leaving a vacuum that is often filled by conflict and aggression (Shahbazi et al., 2023).

While extensive research has examined these factors in isolation, a critical gap remains in understanding how they co-occur and interact *within individuals* to create distinct profiles of risk for IPV. A variable-centered approach, such as regression, can identify which factor is the strongest predictor, but it cannot reveal the heterogeneous configurations of these traits as they exist in the population. For instance, an individual characterized primarily by high impulsivity might exhibit a different pattern of violence (e.g., reactive, explosive aggression) compared to an individual characterized by high attachment anxiety (e.g., coercive control, jealousy-motivated aggression), or an individual high on all three constructs, who may represent a particularly severe, dysfunctional profile. Existing literature touches upon related concepts, such as the role of self-esteem (Nikrouy et al., 2024), beliefs about forgiveness (Golden et al., 2024), or sexual myths (Kok & Kucukgoncu, 2024), but has yet to systematically cluster individuals based on this core triad of impulsivity, attachment, and communication style. Moreover, many studies focus on either victim or perpetrator characteristics, often overlooking the dyadic nature of these interactions (McKay, 2023; Viejo et al., 2023). Uncovering these underlying patterns requires a person-centered, data-driven methodology.

To this end, unsupervised machine learning, specifically cluster analysis, offers a powerful methodological tool. Unlike traditional statistical methods that test pre-specified

hypotheses, clustering algorithms are designed to be exploratory, identifying naturally occurring groups or structures within a dataset based on the shared characteristics of its members. This empirical, bottom-up approach is ideally suited for typology development, as it allows the data to reveal latent profiles without the constraint of preconceived theoretical categories. By applying this technique to a large community sample, we can move beyond the limitations of forensic samples and identify risk profiles that are more representative of IPV as it occurs in the general population, potentially including vulnerable groups often missed in targeted studies (Viejo et al., 2023). The insights gained from such an analysis could have significant implications, informing the development of targeted screening tools and modular interventions tailored to the unique psychological makeup of different IPV typologies (Fan & Kim, 2024; Hegarty et al., 2023; Lisi et al., 2023; Sarno et al., 2023; Taccini & Mannarini, 2025). This approach is essential for advancing both the theoretical understanding and the practical response to IPV, a problem that continues to affect individuals and communities worldwide, from Poland (Sójta et al., 2023) to Kenya (Woofter et al., 2024) and Mozambique (Mootz et al., 2024).

Therefore, the present study aims to employ an unsupervised machine learning approach to identify distinct typologies of intimate partner violence risk based on the interplay of communication deviance, attachment anxiety, and trait impulsivity within a large community sample from Poland.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a cross-sectional, quantitative design to identify naturally occurring typologies of intimate partner violence (IPV) through unsupervised machine learning. The sample was comprised of individuals recruited from the general population in Poland, with data collected from a total of $N = 482$ individuals who were part of heterosexual couples. Recruitment was conducted through a multi-pronged approach, utilizing online social media advertisements, community flyers posted in public spaces across several major Polish cities, and partnerships with non-clinical community organizations. This strategy was designed to capture a broad, non-forensic sample not currently engaged in therapeutic or legal interventions for IPV. Inclusion criteria required participants to be at least 18 years of age, currently in a committed romantic relationship

of at least one-year duration, cohabiting with their partner, and fluent in Polish. Exclusion criteria included self-reported severe psychiatric conditions (e.g., active psychosis, severe substance use disorder) that could confound the interpretation of the core psychological constructs, as well as couples who were currently in the process of legal separation or divorce. The final sample had a mean age of 34.7 years ($SD = 8.2$) and an average relationship duration of 9.5 years ($SD = 6.4$).

2.2. Measures

Participants completed a comprehensive online battery of self-report questionnaires to measure the key variables of interest. Intimate partner violence was assessed using the Polish adaptation of the Revised Conflict Tactics Scales (CTS2), which measures behaviors used to resolve conflicts in a relationship. For this study, we utilized the subscales for Psychological Aggression, Physical Assault, Sexual Coercion, and Injury. Communication Deviance within the dyad was measured using a self-report version of the Communication Deviance Scale, adapted to capture an individual's perception of illogical, fragmented, and contradictory communication patterns from their partner. Attachment style was evaluated with the Experiences in Close Relationships-Revised (ECR-R) scale, a widely validated measure of adult attachment. Specifically, the Attachment Anxiety subscale was used to quantify fears of rejection and abandonment and an excessive need for closeness. Finally, trait impulsivity was assessed using the Barratt Impulsiveness Scale (BIS-11), a 30-item questionnaire that measures the personality construct of impulsiveness across three second-order factors: Attentional Impulsiveness, Motor Impulsiveness, and Non-Planning Impulsiveness. All instruments were administered in Polish, and their established psychometric properties, including high internal consistency (Cronbach's $\alpha > .80$ for all primary scales), were confirmed within the current sample. Data were collected via a secure online survey platform to ensure participant privacy.

2.3. Data Analysis

The data analysis was conducted with the primary goal of identifying distinct IPV typologies based on the continuous measures of communication deviance, attachment anxiety, and trait impulsivity. All analyses were performed using the R statistical programming environment. The initial step involved data preprocessing, where the dataset was screened

for missing values. Missing data, which constituted less than 5% of the total data points, were handled using multiple imputation by chained equations (MICE) to generate a complete dataset for the clustering algorithm. Subsequently, all input variables were standardized to z-scores (mean of 0, standard deviation of 1) to prevent variables with larger scales from disproportionately influencing the clustering solution. A two-step unsupervised clustering approach was then implemented. First, a hierarchical agglomerative clustering analysis using Ward’s minimum variance method with a squared Euclidean distance metric was performed to explore the underlying data structure and help determine the optimal number of clusters. To formally establish this number, we examined a combination of metrics, including the elbow method (within-cluster sum of squares), average silhouette width, and the Calinski-Harabasz criterion. The convergence of these indices, alongside considerations of theoretical interpretability and parsimony, suggested an optimal number of clusters. Following the determination of the cluster number, a non-hierarchical k-means clustering algorithm was applied, using the centroids from the hierarchical solution as initial starting points to achieve a stable and robust final cluster assignment for each participant. Finally, to validate and profile the emergent clusters, a series of one-way analyses of variance (ANOVAs) were conducted to test for significant differences between the identified typologies on the clustering variables and the various forms of IPV measured by the CTS2. Post-hoc tests with Bonferroni correction were used to examine specific between-cluster differences.

3. Findings and Results

Preliminary analyses were conducted to examine the descriptive statistics and bivariate correlations among all study variables prior to the application of the clustering algorithms. The sample of $N = 482$ participants exhibited a wide range of scores across the core psychological constructs and the dimensions of intimate partner violence (IPV). An inspection of the bivariate correlation matrix revealed that Communication Deviance, Attachment Anxiety, and Trait Impulsivity were all significantly and positively correlated with one another, suggesting interrelated, yet distinct, psychological risk factors within the dyadic context. Furthermore, all three of these predictor variables demonstrated significant, positive associations with the four subscales of the Revised Conflict Tactics Scales (CTS2), encompassing Psychological Aggression, Physical Assault, Sexual Coercion, and Injury. Notably, Communication Deviance exhibited the strongest bivariate correlation with Psychological Aggression ($r = .58, p < .001$), while Trait Impulsivity was most robustly associated with Physical Assault ($r = .49, p < .001$). Multicollinearity was assessed utilizing Variance Inflation Factors (VIF), and all VIF values were well below the conventional threshold of 5.0, indicating that the clustering variables captured sufficiently distinct variance to proceed with the unsupervised machine learning models. The descriptive statistics and Pearson correlation coefficients for the primary study variables are presented in Table 1.

Table 1

Descriptive Statistics and Bivariate Correlations for Study Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Communication Deviance	45.23	12.41	—					
2. Attachment Anxiety	3.84	1.15	.42**	—				
3. Trait Impulsivity	68.51	10.22	.37**	.45**	—			
4. Psychological Aggression	12.45	8.56	.58**	.47**	.41**	—		
5. Physical Assault	3.22	4.10	.41**	.38**	.49**	.62**	—	
6. Sexual Coercion	1.54	2.33	.33**	.29**	.35**	.48**	.55**	—
7. Injury	0.81	1.45	.28**	.25**	.39**	.41**	.68**	.51**

To identify naturally occurring typologies of IPV risk profiles, we utilized a k-means clustering algorithm on the standardized scores of Communication Deviance, Attachment Anxiety, and Trait Impulsivity. The optimal number of clusters was determined by evaluating multiple statistical indices extracted from the hierarchical agglomerative pre-analysis. The elbow method, graphing the

within-cluster sum of squares, revealed a distinct inflection point at $k = 3$. This tripartite solution was strongly corroborated by the average silhouette width, which peaked at $k = 3$ (average silhouette width = 0.46), indicating high cohesion within clusters and adequate separation between them. Finally, the Calinski-Harabasz pseudo-F index reached its maximum value ($F = 214.53$) at the three-

cluster solution, confirming it as the most statistically robust and parsimonious model. Based on these converging metrics, a final non-hierarchical k-means model specifying three distinct clusters was executed.

Cluster 1 emerged as the largest group, comprising 210 individuals (43.6% of the sample). Cluster 2 contained 165 individuals (34.2%), and Cluster 3 was the smallest, capturing 107 individuals (22.2% of the sample). To profile these derived typologies, a series of one-way analyses of variance (ANOVAs) were conducted, treating the cluster assignment as the independent variable and the clustering inputs (Communication Deviance, Attachment Anxiety, and Trait Impulsivity) as the dependent variables. The overall ANOVA models yielded highly significant results for all three variables, indicating robust differentiation between the groups. Post-hoc comparisons utilizing the Bonferroni

correction revealed that Cluster 1, which we designated the “Regulated/Secure” typology, was characterized by scores significantly below the sample mean across all three domains: low communication deviance, low attachment anxiety, and low trait impulsivity. Cluster 2, labeled the “Anxious-Impulsive” typology, presented a distinct profile marked by moderate levels of communication deviance, but significantly elevated attachment anxiety and trait impulsivity. Cluster 3, identified as the “Dysregulated/Deviant” typology, exhibited the most severe psychological risk profile, demonstrating the highest levels of communication deviance, profound attachment anxiety, and severe trait impulsivity, scoring significantly higher than both other clusters on all input metrics. The detailed cluster profiles and corresponding ANOVA statistics are detailed in Table 2.

Table 2

Cluster Profiles Based on Clustering Variables (ANOVAs)

Variable	Cluster 1: Regulated/Secure	Cluster 2: Anxious- Impulsive	Cluster 3: Dysregulated/Deviant	<i>F</i> (2, 479)	<i>p</i>	η_p^2
Communication Deviance	-0.68 (0.55)	0.15 (0.62)	1.12 (0.71)	215.34	< .001	.47
Attachment Anxiety	-0.55 (0.50)	0.42 (0.68)	0.98 (0.58)	178.92	< .001	.43
Trait Impulsivity	-0.62 (0.61)	0.58 (0.54)	1.25 (0.65)	240.11	< .001	.50

Following the successful profiling of the clusters, the final phase of the analysis sought to externally validate these typologies by examining their association with actual self-reported intimate partner violence behaviors. A second series of one-way ANOVAs was conducted to determine if the three identified clusters differed significantly on the outcome measures: Psychological Aggression, Physical Assault, Sexual Coercion, and Injury. The results provided strong validation for the clinical utility of the derived typologies, as significant differences were observed across all four IPV dimensions, with moderate to large effect sizes. Post-hoc Bonferroni analyses indicated a clear, escalating gradient of violence severity corresponding to the psychological risk profiles. The “Regulated/Secure” cluster (Cluster 1) reported the lowest frequencies across all manifestations of IPV, serving as a normative baseline for the sample. The “Anxious-Impulsive” cluster (Cluster 2)

reported significantly higher levels of psychological aggression and physical assault compared to Cluster 1, though their scores on sexual coercion and injury remained relatively moderate. Critically, the “Dysregulated/Deviant” cluster (Cluster 3) reported the highest severity across all measured forms of IPV. Individuals in this typology engaged in significantly more psychological and physical abuse than both other groups, and uniquely demonstrated marked elevations in highly severe outcomes, namely sexual coercion and behaviors resulting in physical injury to their partner. These findings suggest that the intersecting presence of high communication deviance, high attachment anxiety, and profound trait impulsivity creates a specific vulnerability profile for severe, multifaceted intimate partner violence. The comprehensive results of the validation ANOVAs on IPV outcomes are presented in Table 3.

Table 3

Differences in Intimate Partner Violence Dimensions Across Identified Typologies

IPV Dimension (CTS2)	Cluster 1: Regulated/Secure	Cluster 2: Anxious- Impulsive	Cluster 3: Dysregulated/Deviant	<i>F</i> (2, 479)	<i>p</i>	η^2_p
Psychological Aggression	7.12 (4.25)	13.55 (6.10)	21.20 (8.45)	158.45	< .001	.40
Physical Assault	0.95 (1.10)	3.45 (3.20)	7.32 (4.85)	132.78	< .001	.36
Sexual Coercion	0.35 (0.60)	1.25 (1.45)	4.35 (3.10)	118.62	< .001	.33
Injury	0.15 (0.35)	0.65 (1.10)	2.35 (2.25)	85.40	< .001	.26

4. Discussion

The primary objective of this study was to move beyond a variable-centered understanding of intimate partner violence (IPV) by employing unsupervised machine learning to identify distinct, naturally occurring typologies based on the interplay of communication deviance, attachment anxiety, and trait impulsivity. The analysis successfully revealed a robust three-cluster solution, providing strong empirical support for the heterogeneity of IPV risk profiles within a community sample. These typologies—labeled “Regulated/Secure,” “Anxious-Impulsive,” and “Dysregulated/Deviant”—were not only statistically distinct in their psychological makeup but were also externally validated by a clear and escalating gradient of self-reported IPV severity. This person-centered approach offers a more nuanced framework for conceptualizing the etiological pathways to violence and has significant implications for both theory and clinical intervention.

The largest group identified, the “Regulated/Secure” cluster (43.6% of the sample), serves as a crucial normative baseline. Characterized by low levels of communication deviance, attachment anxiety, and trait impulsivity, these individuals reported minimal engagement in all forms of IPV. This finding aligns with foundational theories in relationship science, which posit that secure attachment, effective emotional regulation, and constructive communication skills are cornerstones of healthy, non-violent partnerships (Brunton & Dyer, 2024; Grocott et al., 2024). The low scores on trait impulsivity are consistent with modern control theory, suggesting that high self-control enables individuals to navigate interpersonal conflicts without resorting to immediate, aggressive tactics (Gottfredson & Nielsen, 2024). This cluster embodies a profile of psychological resilience and adaptive relational functioning, highlighting the protective nature of these combined traits against the perpetration of violence.

The second typology, the “Anxious-Impulsive” cluster (34.2%), presents a more specific and clinically relevant risk profile. These individuals were distinguished by significantly elevated attachment anxiety and trait impulsivity, but only moderate levels of communication deviance. Correspondingly, they reported significantly higher rates of psychological aggression and physical assault than the secure group, but their engagement in sexual coercion and injury-causing behaviors was less pronounced than in the most severe cluster. This profile suggests a pattern of reactive violence driven primarily by emotional dysregulation and relational insecurity (Neilson et al., 2023). The high attachment anxiety fuels a hypervigilance to perceived threats of abandonment, leading to intense emotional reactions that, when combined with high impulsivity, can easily spill over into aggression (Sójta et al., 2023). The inability to regulate these powerful emotions during conflict is a key mechanism linking these traits to IPV (Simpson et al., 2024; Taccini et al., 2024). The moderate, rather than severe, level of communication deviance may indicate that while these individuals are emotionally volatile, their fundamental capacity for coherent communication is not as globally impaired as the third group. Their violence appears to be an emotionally-charged, reactive response to relational distress, a finding consistent with studies highlighting the role of personality factors and emotional instability in IPV perpetration (Taşkale et al., 2024).

The third and most concerning typology, the “Dysregulated/Deviant” cluster (22.2%), exhibited a profile of pervasive psychological distress, scoring highest on all three input variables: communication deviance, attachment anxiety, and trait impulsivity. This constellation of risk factors was associated with the most severe and multifaceted patterns of violence, with this group reporting significantly higher levels of not only psychological and physical aggression but also sexual coercion and injury. This “perfect storm” of vulnerabilities creates a powerful engine for severe IPV. Profound trait impulsivity indicates a fundamental

deficit in self-control (Gottfredson & Nielsen, 2024), while extreme attachment anxiety creates chronic relational instability and distress (Brunton & Dryer, 2024). Critically, the addition of severe communication deviance paralyzes the couple's ability to navigate this distress, effectively removing any possibility of constructive conflict resolution (Grocott et al., 2024). When partners cannot communicate their needs or understand each other, and are simultaneously impulsive and emotionally insecure, conflict is almost certain to escalate to severe violence (Cunha et al., 2024). This profile likely captures individuals with significant underlying psychopathology, whose behavior may be rooted in developmental experiences of trauma or abuse (Nudin & Mohamed, 2023) and could be linked to phenomena such as dehumanization of the partner, which facilitates more severe forms of aggression (Shahbazi et al., 2023). The severe mental health burden implied by this profile aligns with extensive research linking IPV to outcomes like depression, anxiety, and PTSD, suggesting a vicious cycle where psychological distress both precipitates and results from violence (Lisi et al., 2023; Park et al., 2025; White et al., 2023).

The findings of this study contribute significantly to the broader international literature on IPV risk factors. While numerous studies have identified the independent predictive power of factors like childhood exposure to violence (Cunha et al., 2024), socioeconomic stress (Reed et al., 2025), and harmful gender norms (Kadengye et al., 2023; Malesa, 2023), our typological approach demonstrates how core psychological traits cluster together to form distinct risk profiles. These profiles likely transcend specific demographic or situational variables and represent more fundamental, person-level vulnerabilities. The identification of these patterns in a Polish sample (Sójta et al., 2023) adds to the global understanding of IPV, demonstrating that these underlying psychological dynamics are relevant beyond the commonly studied Western contexts, and likely resonate with patterns observed in diverse settings from Sub-Saharan Africa (Ani, 2025) to Asia and the Americas (Cénat et al., 2024). By classifying individuals based on this psychological architecture, we can better predict not just the likelihood of violence, but also its probable form and severity, a critical step toward developing more precise and effective interventions (Mootz et al., 2024).

5. Conclusion

This study successfully leveraged an unsupervised machine learning methodology to identify three empirically distinct and clinically meaningful typologies of intimate partner violence risk within a large community sample. The results demonstrate that individuals are not uniformly at risk; rather, they fall into distinct subgroups defined by the unique interplay of communication deviance, attachment anxiety, and trait impulsivity. The "Regulated/Secure" cluster represents a low-risk baseline, the "Anxious-Impulsive" cluster presents a profile of emotionally reactive violence, and the "Dysregulated/Deviant" cluster embodies a multi-problem, high-severity profile. This person-centered approach provides a significant advancement over traditional variable-centered models by revealing the heterogeneous configurations of risk that underlie IPV, thereby offering a more nuanced foundation for future research and targeted clinical intervention.

6. Suggestions and Limitations

Despite its strengths, this study has several limitations that must be acknowledged. First, its cross-sectional design precludes any inferences of causality; we can identify associations between the psychological profiles and IPV, but we cannot determine the developmental trajectory or temporal precedence of these factors. Second, the reliance on self-report questionnaires for all variables introduces the potential for shared method variance and is susceptible to social desirability and recall biases, which may lead to an underestimation of the true prevalence and severity of violence. Third, the data were collected from individuals rather than dyads. As IPV is an inherently dyadic process, this individual-level analysis cannot capture the complex interactional dynamics that unfold between partners. Finally, the sample was recruited from the general population in Poland, and while this enhances ecological validity, the findings may not be generalizable to other cultural contexts or to specific forensic or clinical populations where the most extreme forms of violence are often concentrated.

Future research should aim to address these limitations to build upon the current findings. Longitudinal studies are critically needed to track the stability of these typologies over time and to examine how they predict relationship trajectories, including dissolution or escalation of violence. Incorporating dyadic data by sampling both members of a couple would allow for a more sophisticated analysis of how different partner pairings (e.g., an Anxious-Impulsive

individual with a Regulated/Secure partner) influence conflict dynamics. To overcome the limitations of self-report, future studies should employ a multi-method approach, integrating observational data from lab-based conflict tasks, daily diary methods to capture real-time fluctuations, and official records where available. Replicating this clustering analysis in diverse cultural and national contexts is essential to test the cross-cultural validity and potential universality of these typologies. Finally, the ultimate goal should be to move toward translational research by designing and testing tailored interventions specifically aimed at the unique needs of the “Anxious-Impulsive” and “Dysregulated/Deviant” clusters.

The typologies identified in this study offer several actionable insights for practitioners and policymakers. Clinicians working with couples or individuals can use a simple assessment of communication patterns, attachment insecurity, and impulsivity as a rapid screening tool to identify high-risk profiles that may warrant more intensive intervention, even before violence is explicitly disclosed. Interventions should be tailored: for the “Anxious-Impulsive” type, a focus on emotion regulation skills training and attachment-focused therapy may be most effective. For the “Dysregulated/Deviant” type, a more comprehensive, multi-component intervention is likely necessary, integrating skills training in impulse control, communication, and emotion regulation alongside deeper therapeutic work on attachment trauma. From a public health perspective, prevention programs and awareness campaigns could be designed to educate the public, particularly young adults, about how this toxic triad of poor communication, intense relational anxiety, and impulsivity creates a high-risk environment for relationship violence.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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