

Classification of persons attempting suicide. A review of cluster analysis research

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Summary

Aim: Review of conclusions from cluster analysis research on suicide risk factors published after the year 1993. **Methods:** Search and analysis of cluster analysis research papers on suicidal behaviour.

Results: Following groups were distinguished: (1) persons with comorbid mental disorders or with severe symptoms, (2) persons without mental disorders or with mild symptoms, (3) persons with personality disorders and externalizing psychopathology, (4) socially withdrawn persons with a tendency to avoid social contacts, (5) depressive persons.

Conclusions: Analysis of studies on characteristics of suicide attempters, with the application of cluster analysis, has indicated the possibility of differentiation of several groups of persons with significantly increased risk of suicide attempt. The reviewed cluster analysis research had multiple methodological limitations. Studies employing cluster analysis on large, representative and homogeneous population are needed.

Key words: suicide, cluster analysis

Introduction

Suicide is a serious social problem from social and public health perspective. According to recent WHO data suicide is one of the 20 leading causes of death and 1 million people die by suicide each year [1]. Poll research have shown that

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concern about patients committing suicide is common, 97% psychotherapists [2] and 50 to 70% of psychiatrists [3] express it. This concern is well-grounded because we still lack methods for successful suicide risk assessment and prevention. Author of a chapter on suicide prevention in a respected psychiatry textbook notices “suicide is to psychiatrist as cancer to internist – the psychiatrist may provide the optimal care, yet the patient may die by suicide nonetheless” [4]. The topic of suicidal behavior was discussed in Polish literature, e.g. two comprehensive books [5, 6] and multiple papers are available [7, 8].

Authors of this publication obtained data from Analytics Department of Polish National Police Headquarters showing there was 4078 deaths by suicide in Poland in 20101. It shows that there are multiple motives for suicide besides mental disorders. In more than half of the cases (55,6%) the motives were not discovered. The numbers and percentage of identified motives for suicide are described below. The most common motive (in this dataset many motives for a single suicide could be assigned) was “mental illness” (560 cases; 30,9% of cases with the motives identified). Subsequently, among other motives, family misunderstandings (388; 18,6%), chronic illness (269; 14,3%) and economic conditions (244; 13,45%) were mentioned. Among the less frequent motives are: heartbreak (186; 10,3%), death of a loved one (64; 3,5%), committing minor law violation (38; 2,1%), school difficulties (11; 0,6%), AIDS (2; 0,1%) and unwanted pregnancy (1; 0,1%). The data shows that 1453 (24,6%) suicide attempts were committed while intoxicated with alcohol, among them 715 (16,3%) deaths by suicide, 1121 (19%) of persons attempting suicide and 874 (19,8%) of those who died by suicide abused alcohol and 317 (5,4%) of suicide attempters and 214 (5,5%) of those who died by suicide participated in a therapy for alcohol addicts in the past. After reviewing the data obtained from Police Headquarters three facts deserve special attention:

- the data does not imply that “mental illness” could be a motive for suicide in 69% cases,
- in many cases multiple motives were identified,
- suicide was attempted in 16% of cases while intoxicated.

The data confirms the view that suicide is not merely a psychiatric problem and decision for suicide could be triggered by multiple motives.

Research on this topic helped us to identify multiple suicide risk factors [9]. The vast majority of suicide victims suffered from mental disorders. Most frequent diagnoses in this group were affective disorders (30%), substance abuse (18%), schizophrenia (14%) and personality disorders (13%), in particular borderline personality disorder [10-12]. Meta-analysis of studies on prevalence of mental disorders

1 Authors want to thank the Analytics Department of Polish National Police Headquarters for sharing the data.

in suicide victims has shown that from 87,3% up to 99,9% suffered from at least one mental disorder [12, 13].

Available knowledge on suicide risk factors does not permit us to predict and prevent suicide in a satisfactory degree. It is suggested that the approach to prediction of suicide should be more specific and include diagnosis-specific risk factors [9, 14] and should consider the fact that suicide attempters are not a homogeneous population, differing on personality features and other factors connected with suicide. While frequent prevalence of mental disorders in suicide attempters is widely documented, those who do not suffer from mental disorders should not be overlooked. In this context, the research showing a strong correlation between suicide and mental disorders could be misleading and may result in underestimation of suicide risk in persons without mental disorders. Besides, in some cases mental disorder could be only a background, not a leading cause of suicide.

Among other risk factors comorbid mental disorders are a significant one [10, 15, 16]. However predicting suicide based merely on the risk factors did not prove effective [17-19]. For example, suicide risk in people with affective disorders is estimated as 4% [20], it means that this widely mentioned risk factor [12, 21, 22] allows us to predict suicide only in a limited degree. Even the authors of suicide risk assessment handbook published by the APA emphasize in a pessimistic fashion that the "statistical rarity of suicide also makes it impossible to predict on the basis of risk factors either alone or in combination" [12]. In this context, attempts are made to describe diagnosis-specific suicide risk factors [9, 14]. Authors who represent this attitude suggest that focusing on more specific risk factors will permit us for a more precise assessment. This approach has been recently described in detail [9]. This review focuses on studies made by applying cluster analysis to different factors accompanying suicidal behavior. Because of limited number of studies of this kind, we decided to include data on both suicide and suicide attempts despite the fact that these two phenomena could differ on clinical, demographic and social factors.

Results of cluster analysis research described below were based on data gathered by psychological autopsy (interviews with persons who knew the suicide victim) [23], personality inventories [24-26] or clinical inventories [27-30] filled out by patients who contacted mental health facilities because of suicide attempt, or from general population surveys [31] (tab. 1). Similar review was conducted by Arnesman and Kerkhof based on studies from the years 1963-1993. The authors concluded that the results obtained were very general [33] and allowed them to divide suicide attempts into three groups with "mild", "moderately severe" and "severe" lethality. The aim of this work is to review cluster analysis research on suicide attempts published after the year 1993 up to 2011.

Methods

Medline and EBSCO bases were searched for keywords: “suicide” or “parasuicide” accompanied by “group”, “cluster”, “factor” in titles, abstracts and keywords of publications. Both, research on suicide and suicide attempts were included, because the data that would allow to describe these groups separately was very limited. Next, a qualitative analysis based on clinical picture and suicide risk factors described in the research was undertaken. We found ten cluster analysis papers [23-32] and two papers where factor analysis was used [30, 32] for analysis of demographic and clinical factors, personality features measured by personality inventories and characteristics of suicide attempt. Data included psychiatric diagnoses [26] which were based on structured clinical interview [24, 25, 27] and clinical assessment by psychologist or psychiatrist [32]. Brief description of data can be found in Table 1. Next, names and descriptions of the clusters were analyzed to describe the main groups of suicide attempters distinguished in the research. Similarities between clusters were assessed based on their coherence and accordance to the literature. The analysis began with transcribing the features of the clusters. Based on different variables used in the research (prevalence or severity of mental disorders) similar clusters were grouped and validated based on the inner coherence of groups derived this way.

Table 1. **Studies included in the review**

Reference	Research population (* – numbers without missing data)	Data used for cluster analysis	Cluster names, size (%) and description	(*)
O'Connor, Sheehy, O'Connor (1999) [23]	N = 142 74% male average age 41 (13–86) psychological autopsy	clinical, psychological and social data	cluster 1 (45%): without risk factors cluster 2 (40%): living with someone, relationship problems, depression, hospitalized, no psychiatric hospitalization history cluster 3 (15%): severe disorders	II V I
Rudd, Ellis, Rajab, Wehrly (2000) [24]	N = 86* 46% male average age 32 (19–50) individuals were treated in psychiatric hospital because of serious suicidal intent	Millon Clinical Multiaxial Inventory-II	negativistic-avoidant (71%) avoidant-dependent-negativistic (15%) negativistic-avoidant-antisocial (10%) and two small clusters (n = 1 i n = 2)	IV I III

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<p>Ellis, Rudd, Rajab, Wehrly (1996) [25]</p>	<p>N = 301* 187 had suicide attempt 83% male average age 22 (18–37) hospitalized after suicide attempt</p>	<p>Millon Clinical Multiaxial Inventory</p>	<p>negativistic-avoidant-schizoid (51%) avoidant-dependent-negativistic (18%) antisocial (22%) histrionic-narcissitic (8%) and one small cluster (n = 2)</p>	<p>IV IV III -</p>
<p>Engström et al (1997) [26]</p>	<p>N = 215 42% male average age 38 (18–81) hospitalized after suicide attempt</p>	<p>Karolinska Scales of Personality</p>	<p>cluster 1 (27%): CNS disorders cluster 2 (38%): depressive, anxious, alienated, blaming others cluster 3 (13%): impulsive, aggressive, antisocial cluster 4 (22%): with good mental health, first suicide attempt, adjustment disorder</p>	<p>- IV III II</p>
<p>Steer, Beck, Brown, Beck (1997) [27]</p>	<p>N = 1172 127 had suicidal intent 42% male average age 36 psychiatric patients</p>	<p>Beck Depression Inventory, Beck Hopelessness Inventory, Beck Anxiety Inventory, Scale for Suicidal Ideation</p>	<p>hopeless (47%) anxious depressed (21%) below average (19%) above average (13%)</p>	<p>- - II V</p>
<p>Rapeli, Botega (2005) [28]</p>	<p>N = 113* 36% male average age 32 and 33 for females individuals who needed medical assistance after suicide attempt</p>	<p>Hospital Anxiety and Depression Scale, Suicide Intent Scale, lethality of suicide attempt</p>	<p>impulsive-ambivalent (38%) marked intent (47%) definite (15%)</p>	<p>- I V</p>
<p>Chen et al (2007) [29]</p>	<p>N = 148 64% male average age 39 (16–59) psychological autopsy</p>	<p>Suicide Intent Scale</p>	<p>cluster 1 (47%): suicide in circumstances where getting help was not likely cluster 2 (53%): with mental disorders</p>	<p>- -</p>
<p>Dinya et al (2009) [30]</p>	<p>N = 110 20% male average age 16 (14–18) teenagers with suicidal behavior, outpatients</p>	<p>clinical and demographic data</p>	<p>Cluster analysis: stress-laden/medium depressive low depressive/low achievement high depressive Principal Components Analysis: factor 1: stress driven factor 2: dysfunctional factor 3: nonadaptive behavior factor 4: depressive</p>	<p>- - - II - - V</p>

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Flannery, Sneed, Marsh (2003) [31]	N = 2730 49% male teenagers, 8. and 9. grade students	questionnaire research on risky behavior of teenagers	health safety (35%) poor health (17%) sexually active (27%) silent suicide (11%) moderate risk (8%) extreme risk (2%)	- - - II - III
Ortigo, Westen, Bradley (2009) [32]	N = 311 32,1% male average age 40,4 patients after suicide attempt described by psychologists and psychiatrists in a survey	demographic and clinical data, Shedler-Westen Assessment Procedure-II	internalizing dysregulated dependent isolated psychopathic anxious	V I - IV III -

* – cluster grouping in this review

Results

We distinguished following groups of persons attempting suicide described in cluster analysis research papers:

1. *Persons with comorbid mental disorders or with severe symptoms* (the clusters described in the studies reviewed: *cluster 3* [23], *avoidant-dependent-negativistic* [24], *cluster 2* [28], *emotionally dysregulated* [32]). This is a group most similar to the popular view of a suicide victim. Research on suicide risk factors shows that this group is characterized by several comorbid mental disorders [10, 15, 16]. These persons were hospitalized because of mental disorder in the past, but it probably did not bring expected improvement. They attempted suicide in the past. Besides of psychological problems they suffer from poor somatic health and social problems. Personality features such as passive and non-assertive behavior and avoidance of social situations handicaps their ability to seek help and support from others. Emotional instability accompanies a need for being cared by others and high dependency. It is a group that could have experienced psychological trauma in the childhood, e.g. sexual abuse [15, 16].
2. *Persons without mental disorders or with mild symptoms* (*cluster 1* [23], *cluster 4* [26], *below average* [27], *factor 1* [30], *silent suicide* [31]). It was first suicide attempt for most of this group. These persons probably experience intense stress and can have symptoms of adjustment disorder, but do not seek medical help. It is possible that they consider looking for help as a personal failure [23]. They may live alone, what makes obtaining support from close ones harder. In one study, this group got high scores in a lie scale, what could suggest that they have a tendency

- to dissimulate [26]. Some studies suggest that these persons constitute 22% [26] to 24% [23] of all the suicide attempters.
3. *Persons with personality disorders and externalizing psychopathology (cluster 3 [24], antisocial [25], cluster 3 [26], high risk [31], psychopathic [32])*. This group was described before [34, 35]. They abuse drugs and alcohol, suffer from dysthymia and DSM cluster B personality disorders, including borderline personality disorder. Features of this group such as aggressiveness and impulsiveness were described as suicide risk factors frequent in drug and alcohol abusers. They are poorly socialized, highly suspicious, paranoid and self-reliant. Because of that, their behavior is often assertive or even aggressive, hostile and competitive. These persons are often perceived by others as “cold” and “cruel”. They consider themselves “not particularly gifted or capable, they generalize this perception to others” (p. 205 [24]). They perceive the world as a competitive place with other people being exploitive, rejecting and abusive, what makes them highly anxious. Being liked by others is a secondary concern for them and they consider their own hostility and distrust as signs of self-confidence, assertiveness and strength, so they do not feel need to change their attitude.
 4. *Socially withdrawn persons with a tendency to avoid social contacts (cluster 1 [24], negativistic-avoidant-schizoid [25], avoidant-dependent-negativistic [25], cluster 2 [26], isolated [32])*. Personality profile of this group is common among psychiatric patients and applies to 25% of them [25]. DSM cluster A personality disorders and borderline personality disorder are common in this group. Strong anxiety, hopelessness, emotional instability and ruminative guilt are frequently experienced by them. They are not assertive, passive, and prefer if others decide for them. These persons strive to inhibit aggressive impulses when they appear. Furthermore, they feel inadequate and inferior, and have low problem solving skills. Because of that, they are dependent and have a need for being cared, but also distrustful and afraid of being rejected by others, whom they perceive as untrustworthy and rejective. This leads to strong approach-avoidance conflict, anxiety and finally to social withdrawal. They may become detached and “cold”. On suicide risk scales these persons may get scores implying a mild suicide risk.
 5. *Depressive persons (cluster 2 [23], above average [27], definite [28], factor 4 [30], internalizing [32])*. This group is widely described [30, 36]. The most prevalent disorders among suicide attempters are affective disorders. Depression with comorbid alcohol abuse and personality disorders are the most prevalent risk factors in this group. Apart from psychological difficulties, these persons have relationship difficulties and other life problems, e.g. unemployment. They experience high hopelessness and strong suicide intent, and so choose highly lethal suicide methods. Self-harm could have been employed in this group to signalize their suffering to

others, but while it has failed, they decide to commit suicide. Cognitive models of depressions [22] describe this group accurately.

Not all the clusters distinguished in the research papers were included in this classification. Three clusters were specific in respect of distinctive features measured, i.e. histrionic-narcissistic personality type [25], CNS disorders [26], anxious and dependent traits [32]. In other studies, the clusters were distinguished in respect of characteristic features, e.g. features of a suicide attempt [28, 29], or only a limited number of variables was considered [27, 30], what made it difficult to compare the clusters with the results treated in this review. Finally, in one study the remaining clusters were not connected to suicide risk [31].

Discussion

This review has many methodological limitations. There is a need for cluster analysis research with large, representative and homogeneous population. The major limitation is combining together studies on suicide attempts and suicide, but this approach has been chosen because only ten papers on this topic were published since 1993 up to 2011. However, including older research would lead to underestimating major social and cultural changes that happened in the past twenty years. The studies analyzed were often done on small and/or non-representative samples. Therefore, the results described should be taken with care. The methodological difficulties described are due to difficulties in recruitment of suicide attempters and in obtaining postmortem medical records on suicide victims. Moreover, suicide attempters and suicide victims could belong to distinct populations that differ in many ways. Unfortunately the data did not enable us to compare these two groups, so we focused on suicide behavior.

Also the way in which the groups were distinguished has limitations resulting from great methodological diversity of the research in this area. Both the populations included in research and statistical methods used differed from study to study. Because of that, it was not possible to directly compare the research results.

While no significant differences were observed based on demographical variables, research on diagnosis-specific suicide risk factors suggests that this kind of differences exists [9]. Substance abuse and personality disorders are more prevalent in males than in females, so it is possible that the externalizing group would include more males [13, 35]. In females depression is related to suicidal behavior, so we can expect more females in the depressive group [13]. Schizotypal personality disorder is a significant suicide risk factor for males, but not for females, so we could expect a greater percentage of males in the withdrawn group [11]. The gender diversity in prevalence of mental disorders in general population is a fact, but it is worth mentioning that this proportions differ in suicide victims [13].

Cluster analysis research helped to distinguish two characteristic suicide risk groups, that could be more specific than widely mentioned borderline personality

disorder: withdrawn and externalizing. BPD was frequent in both groups. While emotional instability is a feature of BPD that is related to suicide [37], we can suspect that suicide risk is associated with specific personality profiles: withdrawn and externalizing, combined with emotional instability.

Our results suggest that several groups of suicide attempters could be distinguished: persons with comorbid mental disorders combined with social and health problems (group 1) [23, 24, 28, 32]; persons with personality disorders and substance abuse (group 3) [24-26, 31, 32]; socially withdrawn persons (group 4) [24-26, 32]; and depressive persons (group 5) [23, 27, 28, 30, 32]. However, one group that does not present obvious suicide risk factors (group 2) was discovered. The results suggest the suicide risk factors are specific rather for distinct groups than for all the persons attempting suicide. It shows that suicide is committed by various groups, including persons without mental disorders. There are psychological correlates of suicidal behavior such as: social avoidance and externalizing psychopathology that were discussed. It is also worth mentioning that the withdrawn group with DSM cluster A personality disorders (group 4) is poorly described in suicide risk assessment literature [9, 12], although being a risk factor [11, 38].

The results suggest that the nature of suicide attempters is heterogeneous. In some of the groups described suicide attempts were frequent (persons with multiple mental disorders), while in other groups it was a first attempt (persons without mental disorders). There is also a group highly motivated to commit suicide (depressive persons).

Conclusions

Identification of accurate suicide risk factors is a challenge for modern medicine and society. To meet this aim cluster analysis research are conducted. The review of literature on this topic suggests existence of distinct suicide risk groups: (1) persons with comorbid mental disorders or with severe symptoms, (2) without mental disorders or with mild symptoms, (3) with personality disorders and externalizing psychopathology, (4) socially withdrawn with a tendency to avoid social contacts, (5) depressive persons. The results suggest that suicide risk factors could reflect a distorted picture of a person committing suicide. Moreover, cluster analysis research shows that suicide is also attempted by persons without mental disorders. Among psychological traits social avoidance and externalizing psychopathology in persons with personality disorders was found to accompany suicide attempts. Because of methodological limitations of the results discussed, there is a need for cluster analysis research with large, representative and homogeneous population.

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