Articles

Adverse effects of new psychoactive drug use. Psychological insights of addiction

Daniela Madalina Ciucă-Anghel [1], Miriana Stan [1] *, Cristian Bălălău [2], Elena Elisabeta Anghel [3], Denisa Bălălău [2], Ioana Paunica [2], Anca Silvia Dumitriu [4], Stana Paunica [4], Daniela Luiza Baconi [1]

Abstract

Background. When it comes to addicts, the main goal is to solve their addiction, but the real challenge is to understand the patient along with identifying those specific trigger factors that lead to the addictive behavior inset and outlining a pattern for it. Although the current information on drugs is accessible to almost everyone, young people continue to use them, and the national trend is on the rise.

Objectives. The present research includes aim to highlight the main side effects experienced in the past by addict patients, currently undergoing methadone substitution treatment at the C.E.T.T.T. St. Stelian in Bucharest. Based mostly on Adlerian concepts, the study aims to outline the possible triggers that determine certain social behaviors, for example, prone to various addictions.

Methods. To characterize the study group from a psychological point of view, the methods of qualitative research interview and observation and survey were applied. The possible triggers of addictive behavior were highlighted by comparison with a group of non-drug users who voluntarily participated in the study.

Results. The results obtained from the total of 40 subjects included in the study (20 addicts and 20 non-drug users) outlined significant correlations between drug use and the level of education, the sex of the patients, and the degree of awareness of health problems arising from drug use. Drug addicts also identified addiction as a lifeline to their problems. Violence and a history of an unhappy childhood could also lead to addictive behavior. The connection between place and motive for drug use was also outlined. In some cases, concepts such as inferiority complex, sense of social community or social interest, and self-esteem and compensation have been outlined.

Conclusion. Combining toxicology and psychology the anonymous interview/survey used on a wider scale in both detoxification centers and as well as in schools could provide clues on possible prone to various addictions. The research could be therefore useful for the early detection of possible addiction tendencies.

[1] Carol Davila University of Medicine and Pharmacy, Department of Toxicology, 37 Dionisie Lupu Street, zip code 20021, Bucharest, Romania

[2] Carol Davila University of Medicine and Pharmacy, Faculty of General Medicine, 37 Dionisie Lupu Street, zip code 20021, Bucharest, Romania

[3] Ion Creangă State Pedagogical University, Department of Special Psychology – Special Psycho Pedagogy, 1 Ion Creangă Street, zip code 1 MD-2069, Chişinău, Republic of Moldova

[4] Carol Davila University of Medicine and Pharmacy, Dan Theodorescu Hospital, Bucharest, Romania

E-mail corresponding author: miriana.stan@umfcd.ro

1. Introduction

Although the current information on the substance of abuse is accessible to almost everyone, young people continue to use drugs, and the national trend is on the rise (The National Anti-drug Agency, 2020). It is well known that once the addiction to various substances of abuse is established, changes in the psychological sphere occur almost similarly for all affected people, and in most cases, the side effects are mainly psychological (Aday et al., 2020; Biolcati et al., 2017; Cofini et al., 2016; Frisone, 2022; Radeer & Faisal, 2018). Moreover, due to current pandemic some relevant factors produced changes in drug addiction, as in the case of self-medication attempts due to increasing psychopathology (Frisone et al., 2021; Kantoangelos et al., 2020; Moroianu et al., 2021; Settineri & Merlo, 2021). The most used classes of abuse substances are opiates, new psychoactive substances (scientifically known as NPS, most frequently used being synthetic cannabinoids and cathinone), Cannabis, benzodiazepines, hallucinogens, and alcohol. The present research aims to highlight the main side effects experienced in the past by addicted patients. Given the mechanism of action of each class depending on the selectivity for receptors/systems, the main adverse reactions are summarized in Table 1.

Table 1. Main adverse reactions depending on the class of substance of abuse

Drug class	Mechanism of action/receptor	Main adverse effects (reference)
Opiates	Opioidergic system: Miu (μ1-3), Kappa (k1-2), Delta (δ1-2)	Sedation, miosis, respiratory depression, euphoria, nausea, dizziness, constipation, hypothermia, pruritus, bradycardia, antisocial behavior, and insomnia (Baconi et al., 2008; Brown, 2004; Hosztafi, 2011; Wang, 2019).

NPS (synthetic cannabinoids and cathinone)	Cannabinoid system: CB_1 and CB_2 cannabinoid receptors	Agitation, confusion, hallucinations, shortness of breath, tachycardia, psychosis, delirium, hyperthermia, violent behavior, and paranoia (Adamowicz & Gieroń, 2016; Armenian et al., 2018; Ashton et al., 2006; Baumann et al., 2018; Castaneto et al., 2014; Gunderson et al., 2012; Hermanns-Clausen et al., 2018; Howlett et al., 1988, 2002; Katz et al., 2016; Pertwee, 2010; Weinstein et al., 2017).
Cannabis	Endocannabinoid system: CB_1 and CB_2 receptors	Euphoria, injected eyes, mydriasis, tremor, psychosis, disorganized thinking, tachycardia, endocrine disorders, heart damage, delirium, and panic (Jett et al., 2018; Iyalomhe, 2009; Mashhoon et al., 2019; Prakash et al., 1975; Wøien et al., 2015).
BZD	Gabaergic system $GABA_{1A}$ and $GABA_{2A}$	Muscle relaxation (feeling knee joints), sedation, blurred speech, ataxia, coma, decreased appetite, respiratory depression, lethargy, and amnesia (Howard et al., 2014; Nelson & Chouinard, 1999; Pétursson, 1994).
Hallucinogens	Serotoninergic system: $5\text{-}HT_{1A}$, $5\text{-}HT_{2A}$, $5\text{-}HT_{2C}$ Dopaminergic system: D_1, D_2, and D_3 Adrenergic system: α_2	Arrhythmias, hypertension, synesthesia, tachycardia, loneliness, fear, suicidal ideation, psychosis, flashbacks, piloerection, mydriasis, and hyperthermia (Liechti, 2017; Nichols, 2004).
Alcohol	Gabaergic system ($GABA_A$ and $GABA_C$ receptors), opioidergic system, serotoninergic system ($5\text{-}HT_3$)	Euphoria, tachycardia, nausea, vomiting, heart problems, respiratory depression, hallucinations, headache, insomnia, and sweating (Chikritzhs & Livingston, 2021; Costardi et al., 2015; Martel et al., 2018; Reynaud et al., 2001).

Changes in the personality of the addict are assessed with psychological and psychiatric examinations that patients undergo. However, a psychological assessment before the onset of addiction is very rare and only by pure coincidence. Therefore, given the fact that the study aims to highlight the possible triggers for addictive behavior, the interview was based on questions

on the principles of Adlerian theory (1-6) (Fassino et al., 2008; Last, 1997) but also Freudian (7) (Freud, 2014), namely:

1. Individuals are considered social beings, so they are psychosomatic units integrated into the social and cultural context. Therefore, Adlerian theory approaches man from a holistic point of view. In terms of development, the emphasis is no longer on the person's gender but the consciousness.

2. The importance of relationships with siblings and friends of the same age to understand the person in terms of attitude towards social tasks;

3. The contents of the unconscious with emphasis on the desire for self-affirmation and the existence of feelings of inferiority. Although feelings of primary inferiority are present from the beginning of life (through the relationship with parents) and are the motivation for setting and trying to achieve a goal in life, in certain situations (such as lack of education, financial situation, physical appearance, or the existence of disabilities) they can be accentuated leading to the appearance of an inferiority complex;

4. Lifestyle: the concept of self (who am I); the ideal self (whom should I be to find my place in the world); image of the world (beliefs about others); ethical beliefs (personal code of good and evil);

5. The family constellation: the composition of the family, the place occupied in the family, or the position in the family system (order of birth). For this reason, the individual takes over his perception of the family and his role and place in the family and through transposition creates his world, trying to keep the pattern. According to Adler's theory, for each of the 5 positions that an individual can occupy in the family, some consequences can influence the child's development favorably or unfavorably. So, the order of birth influences the formation of a lifestyle;

6. Early childhood memories, dreams, and feelings associated with them. According to Adler's theory, dreams are a way to deal with fears. Since dreams can be interpreted in a variety of ways, the emphasis is only on certain symbols, such as falling, flying, being chased, or being undressed.

7. The relationship with the parents focused on causality and the past, the own childhood experiences within the family being decisive in the development of the personality.

Adlerian psychotherapy also includes questions to help the patient find out what he or she wants, such as, "If I had a magic wand that would eliminate all my symptoms, what would be different?", or "What would be different if you were healthy? "

Adlerian psychotherapy has therefore the advantage that it is a short, psychodynamically oriented psychotherapy and refers to the individual psychology that places the conscious in the center of the personality.

The study also includes highlights on the possible triggers that determine certain social behaviors, for example, prone to various addictions.

Based on the above-mentioned relevant literature, the present research proposes the solution of an anonymous interview/survey being used on a broader scale in both detoxification centers and as well as in schools to provide clues on possible prone to various addictions at early ages.

2. Methods

2.1 Procedure and instruments

The study group consisted of 40 volunteer subjects, of whom 20 were non-drug users (comparator group) and 20 were drug addicts (former heroin and other drug users) undergoing methadone substitution treatment under the Center for Evaluation and Treatment of Toxic Addictions for Young People "St. Stelian", Bucharest.

Approved under approval no. 1 issued on 25-Jan-2021 by the Ethics Council of the Center, the study aims at qualitative research through interviews and observation (Seidman, 2006) of the psychological peculiarities of drug users but also quantitative research by applying the questionnaire *"Drug use assessment - effects felt by the patient following drug use".*

The questionnaire was developed within this research and included questions regarding the frequency of drug use during lifetime and per week, type of consumption, desired effects, and the main adverse effects on the biological systems: cardiovascular, ENT (ear, nose, throat), musculoskeletal, genital, neurologic, pulmonary, psychological, and other types of effects. Between August 3rd and 13th, 2021, 20 interviews were conducted with hospital patients. Informed consent was obtained from all subjects involved in the study. Before the audio recording, patients were presented with data privacy rights, and their consent was accompanied by the signing of a data communication consent form. They were also asked to complete the above-mentioned questionnaire to assess the main adverse reactions induced by various substances of abuse. The interview was a standardized, open-ended interview, covering the same questions addressed to the subjects, on the one hand allowing them to answer freely but at the same time, facilitating faster interviews that can be more easily analyzed and compared. The interview totalized 39 questions, not applicable 100% to non-drug users (such as assessing reasons or other details for consumption, age at the onset, type of used drugs and type of

consumption, and frequency of use), therefore the survey included, on one hand, questions to define the group to which the subject belongs (age category, sex, education) and on the other hand questions with an impact on the psychological profile of the subjects (aspects regarding childhood, relationship with parents, place in the family, existence of nightmares/bad dreams, presence/absence of toxic environment - violence in family or individual, alcohol/drug use in the family, feelings of inferiority/hatred).

In parallel with the interpretation of qualitative data using methods of analysis of communication, text, and interaction, a survey was conducted among the comparator group. The survey was conducted using Google forms *("Drug use. Cause-effect relationship: trauma – addiction")*, and included only the questions within the interview (described above) that applied to non-drug users (age, sex, education, and psychological profile as described above). The collection of information based on this questionnaire was done according to the applicable General Data Protection Regulation (EU) 2016/679.

Also, both the survey and the interview assessed the awareness of the possible medical implications of drug use but also the identification of addiction as an escape or as a life-saving solution to problems.

2.2 Statistical analysis

The data collected from the study were centralized in an EXCEL database and processed using statistical functions appropriate to the data collected. The Pearson correlation test was applied to verify the correlation between various parameters. Pearson's correlation coefficient measures the strength and direction of the relationship between two variables. The relationship between the variables is described using the Pearson correlation, expressed as r (degrees of freedom) = r static, p = p-value. The result of the Pearson test is significant at a *p-value* < .05 (Mihalaş & Lungeanu, 2011).

3. Results

The study group included 40 people, both non-drug users, and addicted subjects, both women and men, aged between 29 and 53 years. A complex description of the study group, including the demographic, psychological, and follow-up questionnaire on the adverse reactions experienced by the subgroup of consumers, is presented in Table 2.

Table 2. Characterization of the study group

Parameter	Group characteristics	
Sex	55% male, 45% female Addicts: male 17 (85%), female 3 (15%) Non-drug users: male 5 (25%), female 15 (75%)	
Male/female ratio	1.22 Addicts: 5.66 Non-drug users: 0.33	
Age (years) (mean ± SD)	Addicts	Non-drug users
	36.1 ± 5.22 male 36.88 ± 5.28 (range 29-45) female 31.67 ± 1.15 (range 31-33)	37.65 ± 8.11 male 35.4 ± 3.78 (range 33-42) female 38.4 ± 9.09 (range 32-53)
Age at intake (years) (mean ± SD)	17.78 ± 5.61 Male 18.24 ± 5.98 Female 15.17 ± 1.04	
Consumption period (years) (mean ± SD)	18.33 ± 4.62 Male 18.65 ± 4.94 Female 16.5 ± 1.32	
Adverse effects	Cardiac effects 34 (5.73%); ENT 35 (5.90%); Gastrointestinal 46 (7.76%); Muscular 54 (9.11%); Genital 27 (4.55%); Neurological 117 (19.73%); Psychological 211 (35.58%); Pulmonary 10 (1.69%); other 59 (9.95%).	
Adverse effects associated with NPS use	Paranoia, auditory hallucinations, visual hallucinations, palpitations, numbness, muscular cramps, agitation, blurred eyes, memory loss, seizures, depression, increased energy, panic, restlessness, specific skin odor, eruptions/wounds, and fever.	
Trigger factors for addictive behavior	Sex, education, unhappy childhood, violence, unawareness.	

3.1 Characteristics of the study group

To characterize the study group, the following demographic aspects were taken into account: age of healthy subjects, age of addicts, age at onset of consumption, sex, and education.

3.1.1 Age and sex

Of the 40 subjects included in the study, the majority were men (22, representing 55%), mainly drug users (male/female ratio 5.66) in the group of non-drug users predominating females (75%). The mean age of addict patients was 36.1 ± 5.22 years and ranged from 29 to 45 years, with male subjects covering a wider age range as opposed to women (ages 31-33) (Figure 1).

Regarding the comparator group of non-drug users, the mean age was 37.65 ± 8.11 years, ranging from 32-53 years. Regarding the age at onset of consumption (Figure 2), the mean age at onset was 17.78 ± 5.61 years and was significantly lower than the mean age of the study group. This indicated a drug use among addicts of approximately 18 ± 4.62 years with a difference of 2 years between men and women.
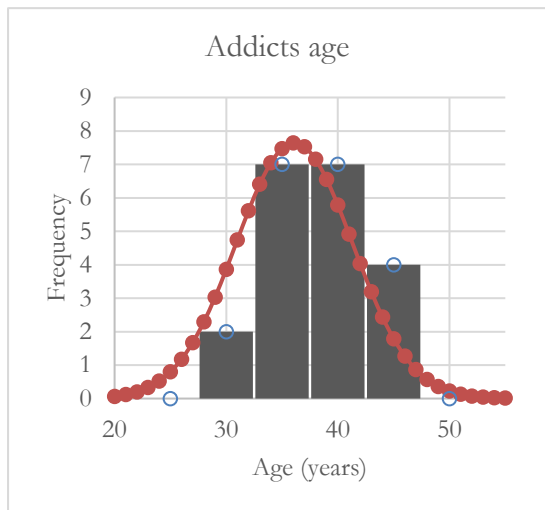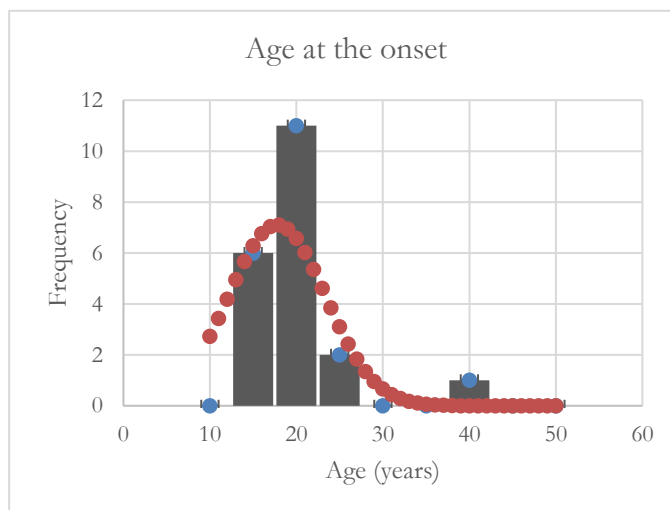

Figure 1. Distribution of age among addicts

Figure 2. Distribution of age at the onset

Age (minimum and maximum, expressed in years) at the onset as well as the length of the consumption period is described in Table 3.

Table 3. Characterization of the study group – age and period of consumption

	Age at the onset (years)		Period of consumption (years)	
	Male	**Female**	**Male**	**Female**
Min	14.5	14	5	15
Max	39	16	25.5	17.5
Mean ± SD	18.24 ± 5.98	15.17 ± 1.04	18.65 ± 4.94	16.5± 1.32
	17.78± 5.61		18.33± 4.62	

3.1.2 Education

Regarding the level of education of the group, there was a high level of schooling among the comparative group (of non-drug users), the majority being graduates of a faculty (95%) and, on the contrary, a high rate of lack of schooling (20%) or at most secondary education (70%) in the group of addicts. The correlation between education and drug use was described using the Pearson test, $R (38) = -0.9282; p <.00001$.

3.2 Correlation between the substance of abuse (NPS) and adverse effects

To assess the correlation between certain substances of abuse (parameter 1, Table 4) and adverse reactions (parameter 2, Table 4), the study group was given the questionnaire *"Drug use assessment - effects felt by the patient following drug use"*. The evaluation of these adverse effects was performed concerning the consumption of NSP (new psychoactive substances, mainly synthetic cannabinoids, and cathinone) known as "ethnobotanical", "legal highs", "bath salts", "Magic", "white powder", and "Pur". The Pearson test was used to determine the degree of correlation. Symptoms that were significantly correlated with NPS (synthetic cannabinoids and cathinone) use are listed in Table 4.

Table 4. Pearson correlation of NPS intake with adverse effects

Parameter 1	Parameter 2	The correlation coefficient, statistical significance $R (df) = r$, p-value; df=18
NPS	Palpitations	*r = 0.533; p = .01553
NPS	Numbness	*r = 0.592; p = .00594
NPS	Muscular cramps	*r = 0.471; p = .03589
NPS	Motor agitation	*r = 0.5 ; p = .02477
NPS	Blurred eyes	*r = 0.453; p = .04488
NPS	Memory loss	*r = 0.596; p = .00555
NPS	Seizures	*r = 0.464; p = .039128
NPS	*Auditory hallucinations*	***r = 0.707; p =.00049*
NPS	*Visual hallucinations*	***r= 0.704; p = .00054*
NPS	Depression	*r = 0.533; p =.01544
NPS	Increased energy	*r = 0.452; p = .04525
NPS	Panic	**r = 0.723; p = .00031
NPS	*Paranoia*	***r = 0.798; p = .000025*
NPS	Restlessness	*r = 0.533; p = .01544
NPS	Specific skin odor	**r = 0.905; p < .00001
NPS	Eruptions/wounds	*r = 0.5 ; p = .02477
NPS	Fever	*r = 0.503; p = .02395

*statistically significant correlation;******statistically highly significant correlation; The Pearson test result is significant at p <.05.

Although a large proportion of adverse effects were also felt in some other areas, being common to heroin use or other substances of abuse, they could not be correlated with NPS (synthetic

cannabinoids and cathinone) use according to the Pearson correlation test. These non-specific adverse effects are presented in Table 5.

Table 5. Non-specific adverse effects after NSP intake

Symptoms	Number of reports	Symptoms	Number of reports
[1]Shortness of breath	11	[4]Empathy	13
[1]Chest pain	10	[4]Anger	14
Abdominal pain	11	[4]Sleepiness	17
[2]Anorexia	15	[4]Tingling	15
[2]Nausea	9	[5]Dry mouth	18
[2]Vomiting	11	[5]Epistaxis	6
[3]Lightheadedness	10	[5]Tinnitus	11
[3]Dizziness	10	[6]Pain	13
[3]Headache	10	[6]Cold	5
[3]Bruxism	11	[6]Fading	3
[3]Tremor	7	[6]Tingling	13
[3]Mydriasis	18	[6]Tension	3
[3]Lightheadedness	10	[7]Anorgasmia	11
[3]Nystagmus	6	[7]Erectile disfunction	2
[4]Low concentration	5	[7]Increased libido	3
[4]Anxiety	11	[7]Decreased libido	11
[4]Dysphoria	10	[8]Shortness of breath	10
[4]Euphoria	12	[9]Diaphoresis	15
[4]Fatigue	14	[9]Insomnia	14
[4]Agitation	16	[9]Nightmares	8
[4]Increased concentration	14		

Effects on biological systems: 1=Cardiac; 2=Gastrointestinal;3=Neurologic; 4=Psychological; 5=ENT; 6=Musculoskeletal; 7=Genital; 8=Pulmonary; 9=Other types.

3.3 Correlation between consumption and various psychological and demographic concepts

As a result of the interviews, several parameters were analyzed as possible triggers of addictive behavior. The answers to the questions were replaced with numbers as follows: answers with a positive connotation or "yes" were assigned the score "+1", those with a negative connotation or "no" were assigned a score of "-1" and neutral or then when subjects could not decide on an answer, they received a score of 0. For each of the 40 subjects included in the study, the *total score* was calculated by adding positive factors (such as education and knowledge of consumption

effects) and decreasing negative factors (such as violence, unhappiness, etc.) and aimed to identify a possible consumption risk among the surveyed participants.

The following parameters were analyzed: how many siblings the subject has, the order in the family, how it was to grow up in the family, the existence of nightmares in childhood, the relationship with parents, if there were addictions in the family environment (alcohol or drugs), if he/she suffered from childhood violence or if he/she witnessed scenes of violence, the presence of feelings of inferiority or hatred and last but not least if at the beginning of the use of drugs they knew about the implications of drug use (the fact that they will get sick).

To assess the correlation between the consumption of drugs (parameter 1, Table 6) and various demographic and psychological concepts (parameter 2, Table 6), the Pearson test was applied to the entire study group (addicts and non-drug users). Parameters that had a statistically significant correlation with the use of drugs (parameter 1) are presented in Table 6.

In the consumer group, a moderate correlation was found between the place where the consumption started and the reason why it started ($R = 0.4728$, p-value = .035268). Very statistically significant positive correlations were identified between addiction and escape ($R = 0.7548$; p-value < .00001) and addiction and life-saving solution to their problems ($R = 0.7645$; p-value < .00001).

Table 6. Pearson correlation of consumption with various psychological and demographic parameters

Parameter 1	Parameter 2	The correlation coefficient, statistical significance $R (DF) = r$, p-value ; $DF = 38$
Consumption	Sex	*R = -0.603; p = .000038
Consumption	Education	**R = -0.9282; p < .00001
Consumption	Happy childhood	*R = -0.4054; p = .009532
Consumption	Violence	*R = 0.4364; p = .004875
Consumption	Awareness	**R = -0.6159; p = .000024
Consumption	Total score	**R = -0.7133; p < .00001

*Statistically significant correlation;**Statistically highly significant correlation; The Pearson test result is significant at p <.05.*

3.4 Qualitative analysis

The interview was structured as described above, comprising the same questions, some providing answers, others being open-ended. The answers given by the subjects outlined concepts such as the inferiority complex, the feeling of social communion, or social interest. To meet the confidentiality requirements, the name of the participants was replaced with a code,

representing the serial number at the interview. Remarks on their qualitative analysis are summarized in Table 7.

Table 7. Qualitative analysis of addicts group

Addict (code, age, sex)	Parameter	Remarks
[1]16, 37 years, M [2]2, 31 years, [3]9, 44 years, M [4]7, 45 years, M	Inferiority complex	"I had a big nose", "I felt inferior at school and in my clothes"[2], "My co-workers ate separately, I was the only gypsy there"[3], "I felt inferior every day, but I never showed that I felt inferior"[4]
[1]7, 45 years, M (former drug dealer) [2]1, 30 years, M	Self-esteem and compensation	"I was someone"[1], "Whoever used drugs was from a good family or had money during that time…"[2]
[1]7, 45 years, M [2]6, 33 years, F [3]1, 30 years, M	The feeling of social communion	"After I had taken drugs I could work"[1], "I stretched out my arm and they injected heroin"[2], "I thought drugs were good, I wanted to be cool like them"[3]
1, 2, 6, 7, 9, 16 = serial number at the interview; M = male; F = female		

4. Discussion

The main aim of the study was to identify the trigger factors that might lead to addictive behavior. Secondly, the study aimed to evaluate a possible correlation between a specific drug class and specific symptoms (side effects). In detail, during the interviews, we also aimed to investigate possible associations between addictive behavior and childhood negative experiences.

Considering self-reported responses assessed by the applicable questionnaire/survey, the results are described as follows.

4.1 Characteristics of the study group

Although almost equally distributed (55% males and 45% females, table 2) by *sex*, there were significant differences between the group of addicts and non-drug users. There was a majority of male subjects in the group of addicts while the female gender predominated within the non-drug users' group. According to the Pearson correlation, we concluded that males were prone to addiction, as the test outlined a statistically significant correlation *R = -0.603; p = .000038* (table 6). Regarding the difference between *age at the onset* of consumption (Figure 2) and the mean age of the addicts' group (Figure 1), we concluded this indicated a long-term period of drug use among addicts, that could lead to various changes in the psychological area. The strong

negative Pearson correlation, $R (38) = -0.9282; p <.00001$ (Table 6) outlined that the presence of drug use was highly correlated with the lack of schooling. We, therefore, highlight the importance of education in drug use prevention. Moreover, information campaigns regarding the risks of drug use in schools are necessary for prevention.

The importance of education is also highlighted in previous studies. Moreover, in addition to a lack of schooling (children's educational underachievement), the existence of parents with low education is listed among the risk factors of addiction. Being an indirect risk factor, low parental education leads to reducing the youth's perception of harm (Hokm et al., 2018; Nawi et al., 2021).

4.2 Correlation between the substance of abuse (NPS) and adverse effects

Symptoms such as palpitations (cardiac effects), numbness and muscle cramps (musculoskeletal effects), agitation, blurred vision, memory loss, convulsions (neurological effects), depression, increased energy (post-consumption), panic and anxiety (psychological effects) but also other types of symptoms such as rashes/wounds and fever were moderately correlated with NPS intake.

The Pearson test indicated a strong correlation between psychological symptoms (such as auditory, visual hallucinations, and paranoia) and NPS intake, from which we can conclude that NPS use had a greater psychological impact on the consumer compared to heroin use (table 4).

Also, the skin of NPS consumers acquired a characteristic odor, which according to the statements of the subjects included in the study, could be identified as: "the smell of plant fertilizer", "the unpleasant smell of cat urine", "the horrible smell of chemicals", "the smell of something fried or rubber", or "the smell of rot".

These results are in line with other studies showing adverse effects reported by healthcare providers from patients seeking medical care after synthetic cathinone use (Prosser et al., 2012). Also, similar results are outlined in an international survey on exposure to drug use (Ciucă Anghel et al., 2022, Motofei et al., 2015).

4.3 Correlation between consumption and various psychological and demographic concepts

Various psychological concepts (history of a happy childhood, violence, and awareness) and demographic concepts (sex, education) along with the total score of the assessment were analyzed to identify a correlation with consumption. As stated before, the *male* gender was statistically significantly correlated with consumption while *lack of education* was statistically highly

significantly correlated with consumption. Also, there was a strong negative correlation between consumption and a history of a *happy childhood*, which means that unhappy children are prone to become addicted adults (R = *-0.4054; p = .009532*, table 6). *Violence* also had a great impact on one's personality, as the Pearson test indicated a statistically significant correlation with consumption (R = *0.4364; p = .004875*, table 6). Usually, consumers were caught in circles of consumer friends (place = extrinsic factor) and driven by curiosity (reason = intrinsic factor) they started using drugs. This could explain the moderate correlation found between the *place* where the consumption started and the *reason* why it started (R = *0.4728, p-value = .035268*). Caught in a vicious circle, consumers identified addiction as an *escape* (R = *0.7548; p-value < .00001*) or even as a *life-saving solution* to their problems (R = *0.7645; p-value < .00001*).

These results are in line with other studies showing that domestic violence, children's educational underachievement, genetic background, and personality traits are among the triggers for addiction (Fatima et al., 2021; Hokm et al., 2018). Moreover, other researchers' results outlined that low levels of conscientiousness can also lead to drug abuse. In these terms, these phenomena can be extended to several medical domains, as in the case of low adherence to prescriptions and recommendations, patients and clinicians' variables (Nakata et al., 2919; Popoviciu et al., 2022; Scandurra et al., 2018, 2021; Settineri et al., 2019). Happiness and subjective well-being, family, and romantic relationships are also mentioned (Ozer & Benet, 2006).

4.4 Qualitative analysis

The qualitative analysis outlined concepts such as inferiority complex (emphasizing feelings of inferiority due to physical appearance, Table 7 - [2]2, or due to discrimination, Table 7 - [3]9), sense of social community or social interest (the need to connect with others and gain recognition in society, Table 7 - [1]7, [2]6, and [3]1), and self-esteem and compensation (the way the individual evaluated himself concerning others, from his subjective approach. The subject replaced feelings of inferiority with the image of oneself after heroin use, Table 7 - [1]7 and [2]1). Such concepts may suggest a weakness in one's personality and the need to be accepted by others.

According to researchers, personality is the most important underlying for addiction. The studies outlined that abusers have personality weaknesses that make them vulnerable to drug abuse (Hokm et al., 2018; Merlo et al., 2020). Low self-esteem (measured as the discrepancy between self and ideal-self concepts) or individuals with deficient self-image are at risk when exposed to drugs (Gossop, 1976; Gugliandolo et al., 2020). Studies show a significant negative correlation between self-esteem and drug use while a significant positive correlation between

drug use and anxiety is highlighted (Taylor & Del Pilar, 1992) supporting the findings in our study and opening considerable perspectives on neuropsychological activation and processing patterns (Barchetta et al., 2021; Di Giacomo et al., 2012; Honkalampi et al., 2022; Pennisi et al., 2022; Vicario et al., 2020). Moreover, the shame condition outlined through the inferiority complex (Table 7) experienced by our study subjects is supported by the results of Matthews et al., 2017 study. The person who is stigmatized by others but who then accepts this treatment stigmatizes himself. In addition to the physical appearance (which is a stigma in itself; e.g., Scandurra et al., 2020), the fact that the subject uses drugs puts a mark on him advertising the character blemish (a second stigma) enforcing the overall effect on the shamed agent (Matthews et al., 2017; Shah et al., 2020).

Several limitations have to be considered though. Firstly, the assessed adverse effects were based on the subjects' confessions through commemoration and had not been certified by a medical professional at the time they were experienced. Secondly, their memories might have been influenced by their mood, also altered in the context of the addiction. Finally, study groups were unequal in terms of gender and education, with small sample sizes.

Despite these limitations, our results could be used for future research and implementation of a school survey for the early detection of possible addiction tendencies in teenagers. Also, the correlation between specific adverse effects and the use of NPS (mainly synthetic cannabinoids and cathinone) could provide useful instruments for NPS abuse diagnosis in emergency rooms.

5. Conclusion

To conclude, it is important to take into consideration all the factors affecting one's tendency toward drugs. Combining toxicology and psychology, the study highlights the main adverse reactions to drug use, emphasizing NPS use, and the possible triggers of addictive behavior. The anonymous interview/survey used on a broader scale in both detoxification centers and as well as in schools could provide clues on possible prone to various addictions. The research could be therefore useful for the early detection of possible addiction tendencies.

The following **learning points** are to be outlined:

- Childhood traumas (unhappiness, violence, nightmares) may have such repercussions on the individual (materialized by a low overall score after the interview);

- The main triggers remain entourage related to access to information and unawareness of the using drugs;

- Stigma and self-stigma have an essential contribution to addictive behavior development;

- Paranoia and auditory and visual hallucinations are strongly correlated with NPS intake;

- The skin of NPS consumers acquires a characteristic odor.

- We recommend this type of interview or survey be implemented for the early detection of possible addiction tendencies in teenagers.

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