

Intervention and prevention programs in substance abuse disorders in the child-adolescent population. A systematic review

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ABSTRACT

Objective: To evaluate the efficacy of intervention programs in adolescents with outpatient or community substance abuse disorders. **Method:** Web of Science, Tripdatabase and Pubmed Medline were searched, the descriptor used was MeSH, and the methodology of the Preferred Reporting Items for Systematic Reviews and Meta-Analyzes model. **Results:** 32 articles were selected as the most suitable, they are distributed in intervention programs, corresponding to 29%, and 71% of prevention programs. In terms of effectiveness, 56% demonstrate conditions for it and 44% are questionable. **Conclusion:** At the end of the review, it was observed that the problem of drug use in the adolescent population is a complex phenomenon in terms of intervention, however, the relationship with neurosciences is still a poorly studied association, despite its considerable influence in this critical period of development.

Keywords: consumption, substances, drugs, adolescent, intervention, prevention, abuse, neurosciences.

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INTRODUCCIÓN

Substance use is a global problem. There are approximately 58 million people with this disorder, which leads to cognitive, functional and social deterioration⁽⁴³⁾.

In Chile, a study on the prevalence of mental disorders in the younger population considered a sample of 1,558 children and adolescents, covering disorders related to substance use of 1.2% of the population with a 2.6% focusing on ages 12 to 18⁽¹⁵⁾.

However, drug use is a multidimensional problem in adolescence, since it is presented as a risk behavior with devastating effects on development⁽¹⁶⁾ because it manifests itself in a period of high vulnerability⁽⁴²⁾.

Adolescents are in search of identity, and tend to overestimate their abilities, which gives them a feeling of invincibility when exposing themselves to less regulated environments. At the same time, these aspects do not allow them to be aware of the complexity of the problem, which is why they take a long time before consulting, making the addiction chronic. A distinctive triad of variables can be observed: tolerance, abstinence in the absence and a compulsive use of the substance⁽¹⁾.

This delay in an accurate diagnosis makes it difficult for the public or private system to provide a program on time, which is why it sometimes results in a decontextualized and ineffective approach that does not contribute to overcoming the problem. For this reason, it is necessary to reflect on programs for the prevention of addictive behavior, and also, on the intervention in confirmed cases.

From a neuropsychological perspective, alterations in the functioning of the prefrontal lobe, mainly inhibitory control, whose function allows managing attention, managing thought and behavior with their corresponding

emotions, and decision making have been observed⁽⁴⁸⁾.

These alterations cause a functional neuroadaptation⁽²⁴⁾, in executive functions, which are the functions that regulate thought, and therefore, the motivational, behavioral and emotional characteristics of human behavior^(6,48). These alterations lead to dependency, which contribute to generating harmful habits that become part of their motivational system, social functioning and decisions in general, being susceptible to severe stress experiences.

It is necessary to understand how substance use can affect the performance of executive functions, inhibitory control, working memory and cognitive flexibility⁽¹⁷⁾, since many of them are of great importance for an optimal level of well-being, promoting cognitive processing and flexibility, favoring behavioral adaptation⁽³⁶⁾.

In this sense, we are faced with a complex system that affects young people in a multidimensional way, that alters their emotional and neurocognitive balance, which compromises their interaction in potential scenarios. Therefore, the health system must understand the relevant notions of care, in order to generate intervention actions⁽³⁹⁾ as a prosocial behavior⁽²¹⁾ to contribute to the understanding and the ideal approach.

Thus, the objective of this study is to evaluate the effectiveness of intervention and prevention programs in the child-adolescent population with substance abuse disorders in outpatient and/or community settings.

METHODOLOGY

A systematic review was carried out following the methodology of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model⁽³⁰⁾ The research

question and evaluation and eligibility criteria were defined considering the PICO question strategy: What intervention and prevention programs for drug use disorders are effective in the infant and adolescent population?

The eligibility criteria consider articles between 2011 to 2021, participants between 10 and 19 years old, and people of both sexes, presenting potential risk or active drug use. It also considers randomized clinical trials, in Spanish, English and Portuguese, with full texts and free access. Education status and/or nationality are not excluded.

As exclusion criteria, studies focused on family interventions, intervention protocols without execution, with a single problematic substance use and with mental health pathologies that prioritize substance abuse were eliminated.

Regarding the search bases, we proceeded to investigate the Web of Science, Tripdatabase and Pubmed Medline. Keywords such as “drug abuse” OR “drug addiction” OR “problematic drug use” OR “harmful use of drugs” AND “intervention programs” OR “prevention” OR “reduction” OR “intervention” OR “Psychosocial Intervention” OR “Prevent” OR “intervene” AND “adolescent” OR “teenager” AND “randomized control trial” OR “RCT” OR “randomized trial” OR “randomized controlled trial” were used.

The evaluation of the eligibility of the studies was carried out between June and August 2021, by two reviewers in an unblinded way. Disagreements between verifiers were resolved by consensus. The data collection process was carried out with the initial construction of an evidence registration matrix that allowed collecting the information of the articles that met the eligibility criteria and recording the reasons for exclusion of the articles that did not meet the criteria.

RESULTS

The results were 493 documents that were filtered until 32 articles were selected.

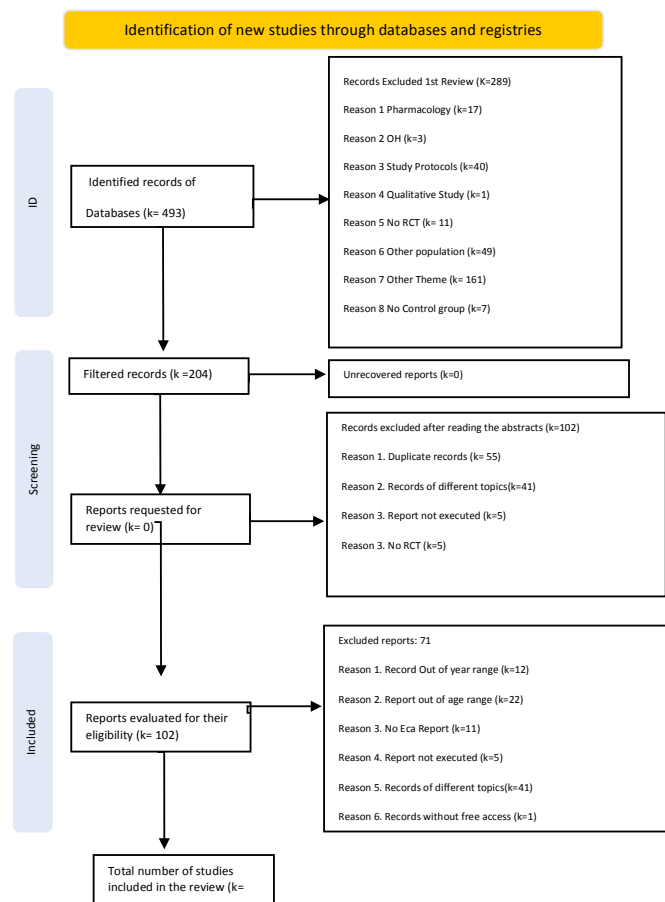


Figure 1. Flowchart.

For organization and analysis purposes, the studies found are presented in two different tables. The first presents prevention actions in 71% (See table 1) and the second intervention action in 29% (See table 2).

PREVENTION ACTIONS

Characterization of the studies

Among the articles selected in Table 1, 68% correspond to studies carried out in the

Table 1. Prevention actions.

Author	Program	Participants	Results
Santisteban et al., 2011. USA	Culturally Informed Flexible Family Treatment for Adolescents (CIFFTA) and Traditional Family Therapy (TFT).	N: 28 Hispanic families with teenagers between 14 and 17 years old	Statistically significant treatment effects by time self-reported drug use (marijuana + cocaine), $F(1, 22) = 10.59, p < .01, \eta^2 = .33$, and adolescent reports of parenting practices, $F(1, 22) = 9.01, p < .01, \eta^2 = .29$. Both sets of analyzes favored CIFFTA participants.
Sussman et al., 2012. USA	Project Toward No Drug Abuse (TND) school substance abuse prevention program	N: 1186 14 to 21 years old	There were no statistically significant differences between the TND MI and TND Only groups.
Huang et al., 2012. Taiwan	Theory of Planned Behavior (TPB) and Life Skills	n: 441 seventh grade students	The experimental group had significantly higher post-test scores in 4 of 5 outcomes, including life skills (96.53 vs. 90.92, $p < .001$), attitude (27.43 vs. 24.40, $p = .012$), subjective norm (29.51 vs. 28.06, $p = .002$) and perceived behavioral control (18.59 vs. 16.81, $p < .001$).
Lisha et al., 2012. USA	Project Towards No Drug Abuse (TND), TND+ Motivational Interview (MI)	N: 1426 Adolescent users from 14 to 21 years old,	In the post-test, those in the TND group answered correctly in 54.3% of the questions, the TND + MI group answered correctly in 55.0%, while the control group answered correctly in 40.3% of the times.
2012; Prado, et al. USA	Familia Unidas Program vs. Community Practice	n: 242 Delinquent Hispanic youth ages 12-17 and their primary caregivers.	The proportion of reported youth substance use (alcohol or drugs) in Familias Unidas decreased from 44.4% to 33.3% at 12 months, while the proportion of substance use increased from 38.8% to 45.5%.
Winters et al., 2012. USA	Brief Intervention for Adolescents (BI-A), Brief Intervention for Parents (BI-AP)	n: 315 Adolescents between 12 and 18 years old	Both intervention groups (BI-AP and BI-A) revealed better results compared to the CON group (Student-Newman-Keuls (SNK) post-hoc tests, $p < .05$) on five outcome variables (days of alcohol use, days of cannabis use, symptoms of alcohol abuse, symptoms of alcohol dependence, and PCS)
do Nascimento y De Micheli, 2015. Brazil	Single Conference, Prevention carried out by teachers and Prevention carried out by experts.	n: 1316 8th to 11th grade	The impact of the "Single Conference" intervention was positive only for alcohol. Regarding preventive interventions, the impact of reception and results was more significant in those carried out by teachers than by experts, in substances such as alcohol, cannabis, cocaine and crack.
Schwinn et al., 2015. Unites States	Personalized virtual drug abuse prevention program	n=236, 15 to 16 years old	At 3 months, the adolescents in the intervention group showed less stress, drug use between peers, diversity of substances in relationship, conflict resolution, coping skills and refusal towards the proposal of using in comparison to the contrast group.
Marsiglia, et al 2016. USA	Keepin'it REAL (kiR) Universal School Program for Teens and Families Preparing the New Generation (FPNG) for parents	n: 267 7th to 8th grade and Latinos	The program contributed to the reduction of tobacco use, in addition to observing a system with stricter standards of care regarding the use of tobacco and alcohol.
Champion et al., 2016. Australia	Escuelas Climáticas Program	n: 1126	There were not any notorious differences in terms of the intention to use among young people.
2018; Sanchez, et al. Brazil	Tamojuntó Program	n: 8247 enrolled in 7th and 8th grade	Alcohol was the most used substance in both groups. The intervention positively impacted inhalant use, drinking episodes.
2016; Butzer, et al. 2017. USA	Yoga Clases	n: 117, Students from 7 th to 12 th grade.	Participants in the control group reported significantly more willingness to smoke cigarettes at the time 2 ($M=3.44, SD=1.06$) than participants in the yoga group ($M=3.21, SD=0.76$).
Valente et al., 2018. Brazil	# Tamojuntó Program	n: 8503 12 to 13 years old, with active drug use	Consumption characteristics in both groups were similar. The following classifications are distinguished according to their consumption: polyconsumers, compulsive and low alcohol drinkers abstainers.
Champion et al., 2018. Australia	Escuelas Climáticas Program	n: 1126	The intervention program contributed by improving the knowledge about ecstasy and other drugs.
Spirito et al., 2018 USA	Motivation Enhancement Therapy (MET); Family Check-up (FCU) and Individual Psychoeducation (EF)	n: 69 adolescent students and 69 parents	Positive urine drug screen (UDS) for THC also showed a lower trend in MET/PCU (43.3%) vs. PE (64.5%) at six-month follow-up, $\chi^2(1, 60) = 2.76, p = 0.08$.
Champion et al., 2019. USA	LIFT Program (Linking Information and Families Together)	n: 318, 12 to 13 years old enrolled in 6th grade	Regarding the consumption of alcohol and cannabis, there were no significant differences between the two groups. The LIFT program increased communication between the school and parents.
Champion et al., 2019. USA	CSBI (Computer Based Screening and Brief Intervention System) Program	n: 965, 12 to 18 years old	There is a high percentage of young people whose consumption is primarily alcohol (in 1 year). Cannabis is the most widely used drug.
Champion et al., 2019. USA	Ehealth Familias Unidas	n: 230, 13, 6 years old	Within the intervention group, there is greater effectiveness observed in the control group, associated with its decrease in inhalants, cannabis, tobacco. Regarding alcohol, it did not affect the observed trajectories.
2018; Sanchez, et al. 2019. Brazil	School prevention program #Tamojuntó (Unplugged)	n: 6391, 12 a 13 años de age	#Tamojuntó did not show success in the change of normative beliefs proposed by the theoretical model program.
Champion et al., 2020. USA	Storytelling 4 Empowerment (S4E) Program	n: 50 13-21 years old attending a community health clinic	The personalized intervention contributed significantly to the decrease in the use of tobacco, drugs, alcohol and selfcare specifically the use of condoms having previously used drugs and alcohol.
Champion et al., 2020. USA	Screening, Brief Intervention (BI) and Referral to Treatment (SBIRT) Model	n: 9639, a study with adolescents from 12 to 17 years old.	The Generalist Condition had a significantly higher self-reported penetration of BI administration than the Specialist Condition (38% vs. 8%; Adjusted Odds Ratio = 6.53; $p = .005$).
2020; Marsch, et al. 2021. USA	Interactive web-based program (POP4Teens [P4T]) VS JustThinkTwice (JTT)	n: 406 12 to 17 years old	Both programs were effective in consistently and significantly decreasing concordance with positive expectations (in all cases for P4T / in most cases for JTT).

United States^(3,7,9,13,19,23,25,27-29,33,37,38,41,46), 18% to Brazil^(18,34,35,44), 9% to Australia^(10,11) and 5% Taiwan⁽²²⁾.

Among the programs executed are Project Towards No Drug Abuse (TND)⁽⁴¹⁾, TND with Motivational Interviewing⁽²⁵⁾, Brief Intervention (BI)⁽⁴⁶⁾, Screening, Brief Intervention, and Referral to Treatment (SBIRT) model⁽²⁹⁾, virtual or computer system-based programs^(13,19,23,27,38), Motivation Enhancement Therapy (MET) and Family Checkup (FCU)⁽³⁾, Keepin’it REAL (kiR) school program for adolescents and Families Preparing the New Generation (FPNG) for parents⁽²⁸⁾, #Tamojunto school prevention program^(35,36,46), LIFT Program (Linking Information and Families Together)⁽⁷⁾, Climate Schools Program^(10,11), theory of planned behavior (TBP)⁽²²⁾, United Family Program⁽³³⁾, Psychoeducation by Single

Conference Prevention carried out by teachers and Prevention carried out by experts⁽¹⁸⁾; and Yoga Classes⁽⁹⁾.

Regarding the ethnic groups represented, there are ten studies where there is a higher representation of Hispanic American participants^(7,18,25,28,33,35,36,38,42,45); in other 9 it is White Caucasian ethnicity^(2,3,9,11,13,23,27,29,39).

Regarding gender, there are twelve studies with larger female representation^(7,9,13,20,22,23,27,29,36,39,45,47) and seven studies with a male population^(3,10,25,28,33,35,42).

Effectiveness in studies that include prevention actions

According to the information extracted from the studies, 68% showed to be effective in the short term^(3,11,13,20,23,25,27-29,33,36,38,39,42,47), while a 32% did not

Table 2. Intervention Actions.

Author	Program	Participants	Results
Evers, et al. 2012. USA	Intervention program based on the Transtheoretical Model of change	n: 1590 10 to 14 years old	There is a high degree of effectiveness in the students, since a large number moved on to the Action or Maintenance stage.
Walton et al. 2013. USA	Computer-delivered brief interventions (CBI) or therapist-delivered (TBI)	n: 328, a study with cannabis user adolescents from 12 to 18 years old.	With no effects of a computer or therapist BI on cannabis use; however, the data supports the short-term efficacy of CBI in decreasing the number of cannabis-related consequences and the frequency of use of other drugs
Winters., et al. 2014. USA	Brief intervention program, around motivational interview (EM)	n: 284 13 to 17 years old who are potential drug users	Similar data are observed in terms of alcohol and cannabis withdrawal in the BI-A (adolescents) and BI-AP (adolescents and parents) groups and are progressively increasing. The BI-A group showed reductions in substance use.
2014; Piehler, et al. 2015. USA	Brief Intervention Program	n: 259 12 to 18 years old Suspected of having a substance use disorder	Women had higher abstinence rates than men. People who exhibited moderate to severe behavioral disturbances demonstrated higher dependency rates. No significant differences in abstinence or dependence rates are observed either by depression symptoms or anxiety.
Arnaud., et al. 2016. Sweden, Germany, Belgium and the Czech Republic	Brief Motivational Intervention Program	n:1449 16 to 18 years old, with a risk of developing substance use disorder	Mixed models revealed significant reductions in alcohol use.
Blevins et al. 2016. USA	Motivational Enhancement Therapy Program	n: 252 14 to 17 years old with drug use and no psychiatric disorder.	The intervention proved that in a period of 15 months there was a decrease in the use of synthetic cannabis and symptomatology of drug abuse disorder.
2013; Chang, et al. 2018. Taiwan	e-course program	N: 68 12th grade	In the main intervention, both groups (intervention and control) did not present significant differences in variables that mainly pointed to stop use. In reinforcement intervention, it was proven that a greater intensity leads to better results.
Blevins., et al. 2018. USA	Motivational Enhancement Therapy Program	n:252, average age 15.84, cannabis use on at least 9 times in the previous 30 days	The intervention proved that in a period of 15 months there was a decrease in the use of synthetic cannabis and symptomatology of drug abuse disorder.
Danielson., et al. 2020. USA	RRFT Program (Risk Reduction Through Family Therapy)	n: 124 13 to 18 years old.	The RRFT produced significant reductions in substance use from start to end. Regarding PTSD, there were no significant differences in both groups.
Alderson., et al. 2020. England.	Motivational Enhancement Therapy (MET) and Social and Network Behavior Therapy (SBNT)	n: 1450, between 12 to 20 years old who received health care and have reported active drug use	Of the most used drugs, alcohol stands out; secondly: legal drugs; then cannabis; Lastly, medicines. There is a high percentage of people who have not been involved in risk consultations.

show clear results^(7,9,10,19,23,35,45). 27% involved the family, also improving the levels of communication between the members^(3,7,21,27,28,33). Within the last 3 years, online prevention programs have been incorporated and represent 22%^(13,19,23,27,39).

Intervention actions

As mentioned, the programs that refer to the intervention actions are presented, in **Table 2**.

Characterization of the studies

Table 2 shows 67% as intervention studies corresponding to the USA^(8,14,20,32,46,48), the remaining 33% is divided equally between England, Taiwan and a group of European countries^(2,5,12). The programs that were executed are found in the transtheoretical model of change⁽²⁰⁾, in brief intervention^(32,48), motivational therapy^(5,8), risk reduction through family therapy (RRFT)⁽¹⁴⁾ and computer-delivered interventions^(12,46).

In relation to the ethnic groups represented, there are studies where Caucasian American participants

have a greater representation^(2,8,14,20,32,48).

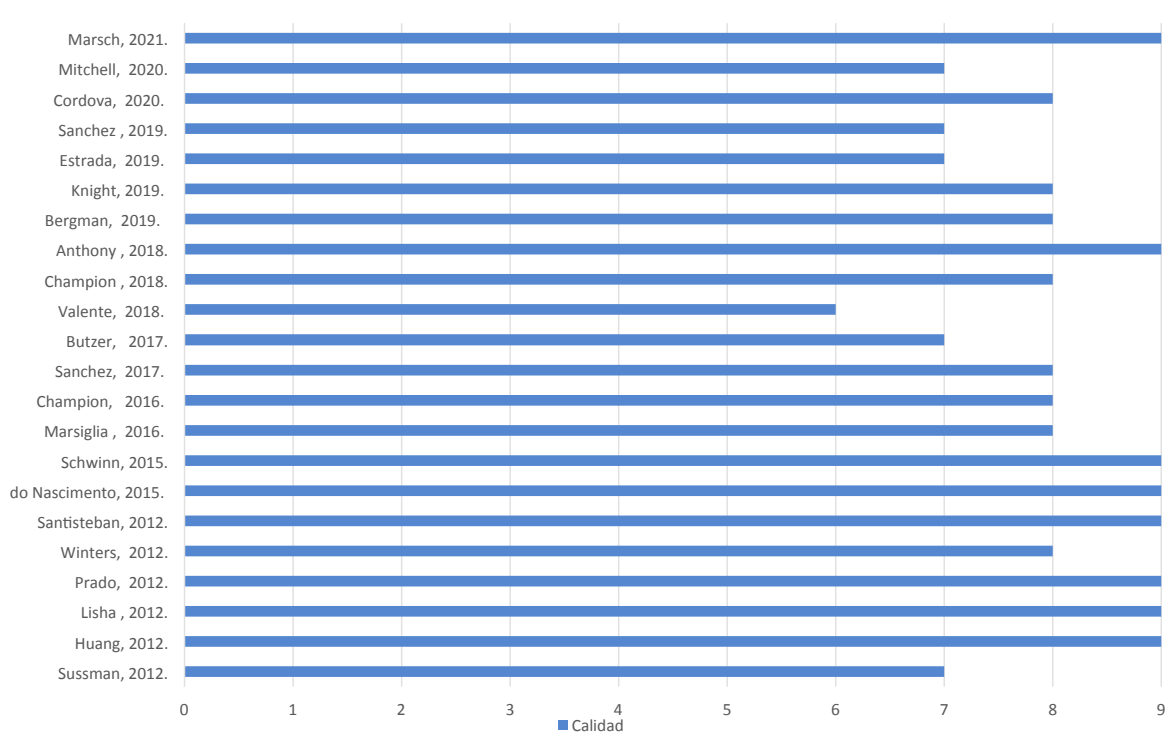
Regarding gender, eight studies have more female participation^(2,8,12,14,22,32,48).

Effectiveness in studies with intervention action

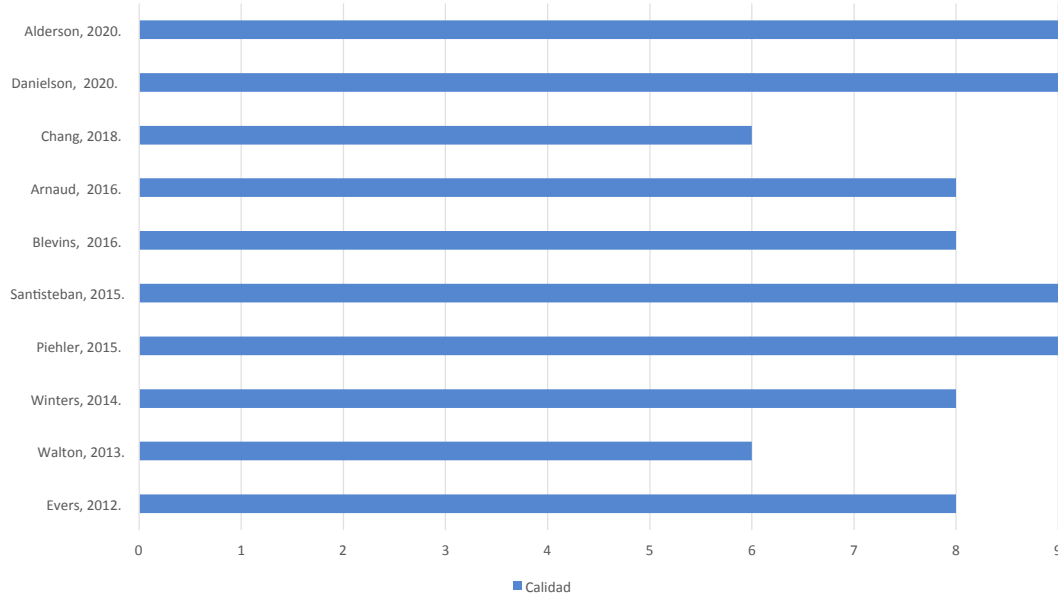
Regarding effectiveness, 56% of the studies show positive results^(5,8,14,20,48) and 44% are inconclusive. Among the studies that showed effectiveness, they were mainly based on motivational therapy⁽⁸⁾, in brief interventions^(5,48), transtheoretical model of change⁽²⁰⁾ and risk reduction through family therapy (RRFT)⁽¹⁴⁾.

Quality evaluation of the Critical Review of quantitative studies

To measure the quality of the studies, the quantitative critical review form developed by Law, et al. (1998): which considers title presentation, clear objective, reviewed literature, described design, identified sample, sample justification, reliable results, significant results, intervention and conclusion were used.



Graph 1. Quality Critical Review of Intervention Actions.



Graph 2. Quality Critical Review of Intervention Actions.

The studies shown in **graph 1**, are those that reach a higher level of quality represent 45%^(3,18,22,25,28,33,38,39,46,42) and those of lower quality that represent 14%^(10,19,45).

In **graph 2**, the articles that obtain the highest quality represent 44%^(5,8,14,48). The lowest quality study corresponds to Chang et al. (2018).

In both classifications, prevention and intervention programs, there is a large percentage of studies implemented in the United States, which represents 67% of the total number of studies^(3,7,8,9,13,14,19,20,23,25,27,29,32,33,38,39,42,46-48), this makes it difficult to assess the effectiveness of treatments and intervention models in populations with different social and cultural norms. In Latin American, we only found 4 studies in Brazil which focus on prevention programs^(18,35,36,45), and where the level of effectiveness is not as high compared to the other studies.

The heterogeneity between the sexes of the users significantly influences the knowledge on the distinction of neurological, social, addictive repercussions, from receiving treatment and other related variables. There is a difference between

sexes in prevention and intervention programs. In the first ones (12 of them) there is a greater participation of women^(7,9,13,18,22,23,27,29,36,39,45,47), while in the second ones, only 1⁽⁶⁾, this could be explained from a perspective that women are more exposed to stigma when it comes to asking for help and integration to intervention⁽³⁴⁾.

DISCUSSION

In this systematic review it has been possible to state that within the existing evidence there is a significant difference between the trials that include preventive interventions versus the intervention itself. This is 71% and 29% accordingly, which indicates the wide coverage of professional actions aimed at eliminating or modifying the risk factors that favor the consumption of alcohol or reducing the probability of developing it. However, the scarce research on ongoing therapeutic interventions in the adolescent population suggests there is a wide gap in terms of truthful, quality therapeutic methods that meet the complex criteria that this problem entails.

Evidence on the veracity of efficient interventions for the adolescent addict population, is insufficient.

However, those that suggest better results are those that include several therapeutic strategies within the same treatment plan, which supports the convenience of adapting these processes to the individualities of the users considering their personal, family and social variables, including, prosocial environments that play the role of auxiliary services in the face of contingencies⁽⁴⁰⁾.

There is little neuroscientific evidence on studies carried out in the child-adolescent population referring exclusively to the problem of drug abuse and its consequences related to neurosciences. However, there is a history of cognitive alterations in the referred population with early start of drug use, observing a loss or alteration in learning and verbal memory, visuospatial memory, attention and working memory. Nevertheless, subjected to a treatment that promotes substance withdrawal and specialized therapeutic training, cognitive functioning can be progressively recovered⁽³¹⁾.

Lisdahl *et al.*, (2013) investigate a fundamental fact to study the phenomenon of addiction, stating that these alterations increase when using at a young age. This allows us to begin to understand the magnitude of the influence of drugs in a critical period of development such as adolescence⁽³¹⁾.

LIMITATIONS

In first place, investigations related to a mental health diagnosis, whether comorbid or primary to the consumption of psychoactive substances, were excluded, which significantly influenced the numerical variable at the time of filtering. Second limitation: Including studies that comprise different treatments for them was a factor that allowed expanding the search for more holistic

treatments, but affected the knowledge of the specificity of certain treatments contemplated for a drug. The third limitation is the lack of records that indicate pharmacological treatments as interventions for substance abuse disorders, this causes discrimination on the understanding of the effectiveness regarding therapeutic pharmacology. Fourthly, there is the selection filter towards open access documents, which affects being able to obtain exclusive texts, limited editions and/or obtaining the complete content.

CONCLUSION

Prevention and intervention programs in adolescents regarding problematic drug use are undoubtedly a great public health debt. There is a misunderstanding regarding the indiscriminate use of drugs that are considered legal and of which there is little control and a certain social approval, which generates unclear messages about consumption and its effects, especially in the neuropsychological sphere.

Thus, this review has reported 31 articles on specific approach programs, of which only 20 have been declared effective considering their goals.

This is probably a major challenge for professionals who specialize in the prevention of neuropsychological diseases, or are related to executive functions and to presenting ways or strategies to promote a healthy lifestyle and prevention of behaviors that could leave behind consequences in this area of human development. There is still much to investigate and reflect on in this matter.

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