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SYSTEMATIC REVIEW: RISK FACTORS FOR CANNABIS USE AMONG ADOLESCENTS

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Abstract

Adolescence involves constant biological and psychological changes, such as the development of abstract thinking and imaginary audiences. This is a delicate time for adolescents, as a number of variables can contribute to risky behaviour, especially substance use. Cannabis is the most popular drug among adolescents. In order to establish effective prevention strategies, it is essential to review all adolescent risk factors. For this reason, a systematic review of twenty-two studies, selected based on previously established criteria and methodology, has been conducted. Sociodemographic characteristics, such as age and gender, peer influence, family structure and parental support, mental health and parental substance abuse have been identified as some of the most influential risk factors. This review is a step toward the development of effective school and family prevention strategies for this important topic.

Key words: adolescence, cannabis, risk factors.

Resum

L'adolescència inclou constant canvis biològics i psicològic, com el desenvolupament del pensament abstracte i l'audiència imaginària. Aquest és un període delicat pels adolescents, ja que un gran nombre de variables poden contribuir a comportaments perillosos, especialment a l'ús de substàncies. El cànnabis és la droga més popular entre els adolescents. Per a poder establir plans de prevenció efectius, és essencial revisar tots aquells factors de risc adolescents. Per aquesta raó, s'ha dut a terme una revisió sistemàtica de vint-i-dos articles, seleccionats a partir de uns criteris i una metodologia prèviament establerta. Característiques com l'edat, el gènere, la influència dels iguals, l'estructura i el suport familiar, la salut mental i l'abús de substàncies per part dels pares, han estat identificats com a factors de risc principals. Aquesta revisió és un pas endavant cap al desenvolupament d'estratègies de prevenció afectives dintre de l'àmbit escolar i familiar per a aquest tema tan rellevant.

Paraules clau: adolescència, cànnabis, factors de risc.

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1. Introduction

1.1. The age of adolescence

The word adolescence is derived from the Latin word *adolescere,* which means "growing" and "maturing." This highlights the transitional phase of development that occurs between childhood and adulthood and is characterized by change. Due to the numerous significant changes that take place between these ages, some authors refer to this phenomenon as a second birth (Moreno, 2015). One of the most difficult aspects of this topic is defining the beginning and end of this life stage; topics such as completion of education, marriage, and parenthood, as well as adulthood, are in constant delay today. As a result of this time shift, adolescence now occupies a larger portion of life; a clear delineation of this age gap can be crucial for adjusting societal rules, such as laws, social policies, and service systems (Sawyer et al., 2018). Based on the arguments of various authors, this research has established this age range to be between 10 and 21 years old.

Even though not all authors can reach a consensus on this age difference, everyone agrees that the transition from childhood begins when puberty begins; this is the time when more body changes occur, which can have a significant impact on a teen's constantly shifting self-image, as they must adjust to their new body characteristics. Significant characteristics of puberty include the development of external and internal genital organs, menstruation, and ejaculation; however, secondary sexual characteristics that are unrelated to reproduction include hair growth on different parts of the body, skin and voice changes, and muscle development (Labrada et al., 2022).

Secondly, when it comes to psychological changes in adolescence, there are two distinct stages: cognitive development and personality development. One of the most significant changes in cognitive development during adolescence is egocentrism; according to Piaget's period of formal operations, (Piaget 1962) abstract thought is acquired during the transition from the concrete operation stage to the formal operation stage. This is characterized by adolescents' confidence in the omnipotence of their own thinking, which can now be perceived as more sophisticated and casual. This ability to think

abstractly encourages adolescents to develop new hobbies and interests in a variety of fields, such as music, sports, and religion. Additionally, it encourages them to question pre-established norms, and they develop a greater interest in social, economic, and cultural issues. Also, during adolescence, individuals become more eager to try new activities, discover sex, and assume risks (De Micheli et al., 2016). Elkind (1967) describes two specific aspects of this egocentrism: first, the imaginary audience, which describes the excessive preoccupation that teens have with the image that their peers have of them and the belief that everyone is constantly observing them, thereby creating an imaginary public in their minds for which they are constantly acting; second, the personal fable, which describes the feeling of uniqueness that adolescents feel about themselves, this leads to the belief that their opinions and feelings are different from others, and can turn into them thinking that no one can related to them (Labrada et al., 2022). Alternatively, when developing their personalities, adolescents must create a coherent identity, which, according to Kimmel and Weiner (1998), entails an ideological aspect with beliefs and values, an interpersonal aspect with a definition of their sexual orientation, and an occupational aspect with educational and occupational goals. This process of personality development can exacerbate three symptoms: antisocial behaviors, depression, and self-destructive behaviors such as suicide or drug use; the focus of this study will be on drug use. Authors such as Rosenberg (1965) and Erikson (1950) have centered their attention on the identity development of adolescents; Rosenberg asserts that adolescent self-concept is unstable, characterized by a fear of looking foolish and a tendency to place themselves on a lower rung than their peers; Erikson, on the other hand asserts that adolescents experiment and experience identity crises, and that society plays a role in their identity construction, guiding them and putting limits in their choices (Labrada et al., 2022).

After the conclusion of these biological and psychological changes, the transition into adulthood occurs, and maturity is acquired. (Moreno, 2015).

1.2. Cannabis use

The most common definition of drug refers to any substance that modifies mind and body functioning; but if we target specifically on psychoactive

drugs, we can state that there is a drug component that affects the central nervous system and alters perceptions and consciousness. This research will focus on marijuana, which consists of the dried leaves, flowers, and seeds of the Cannabis sativa plant. Delta 9-tetrahydrocannabionol, also known as THC, is the primary psychoactive that has the mind-altering ingredients of this drug; it is responsible for the euphoric effect, also known as "getting high," that this drug has on its users. There are numerous ways to consume cannabis, with the most common being smoking or mixing it with cookie or brownie batter in the form of an editable. Other cannabis modifications, such as hashish, can contain greater amounts of THC (Hanson et al., 2011).

THC travels through the brain and other parts of the body to produce the effects of cannabis consumption. The most significant effect is produced in the brain, where this component begins to interact with cannabinoid receptors, influencing the way cells function and communicate. THC has a reinforcing effect on the reward system; it stimulates nerve cells, which then produce more dopamine than normal. This excessive amount of dopamine is the reason the brain craves this gratifying effect and the cause of this drug's addiction (Carr et al., 2022).

The concept of addiction refers to the psychological attachment a subset of individuals have to a particular drug. And it is one of the distinguishing factors between drug use and abuse. On the one hand, drug use is defined as the occasional consumption of a drug, in this case cannabis, whereas drug abuse is typically more intense and is characterized by the consumer's addiction to the drug. Cannabis, along with other substances such as alcohol and tobacco, are referred to as "getaway drugs" because their use can lead to the use of more addictive substances such as cocaine and heroin (Hanson et al., 2011). This review will focus on drug use, which can eventually lead to addiction.

THC's reinforcing effect on the brain's reward system is the reason why 17% of young adults who begin using cannabis during adolescence develop a dependency to those substances at some point in their lives; this reinforces the notion that excessive use of this drug during adolescence is associated with a high risk of addiction as an adult. Regarding this reinforcing pattern, those adolescents who report more positive effects during their first cannabis

experiences and those who have consumed cannabis more than five times in their lifetime are at the greatest risk of dependency (Carr et al., 2022).

1.3. Prevalence data for cannabis use

According to the United Nations, an estimated 192 million people used cannabis in 2018, which is equivalent to 3.9% of the population between the ages of 15 and 64. Cannabis use is less prevalent in low- and middle-income countries than in high-income countries (Connor et al., 2021). Approximately 11,6 million adolescents between the ages of 15 and 16 use marijuana today, making it the most popular illegal drug among young adults worldwide. Compared to the entire population, this represents an annual prevalence of this drug consumption of 4.7%. Oceania has the highest rate of 16- to 17-year-olds who use marijuana, at 17.8%, followed by the United States at 12.1% and Europe at 11.7% (Carr et al., 2022).

A number of nations, including North America, South America, Africa, and Asia, have reported an increase in consumption over the past few years. Central and Occidental Europe have remained stable, with the exception of Italy, Germany, and the United Kingdom, where it has also been rising (Carr et al., 2022).

It is also important to report the fact that approximately 9.9% of this drug's users are daily or near-daily consumers (Connor et al., 2021).

In addition, a comparison of the differences in prevalence between men and women reveals that men have a greater tendency to consume, with a result of 9.1% based on surveys conducted in Europe, compared to women's result of 4.4%. This trend also applies to adolescence, where the difference between males and females aged 12 to 17 years was 9.0% versus 6.7% (Secades & Fernández, 2017). This prevalence data should be considered when evaluating the risk factors for teen consumption and developing prevention strategies for this age group.

1.4. Risk and consequences of cannabis consume

As we have seen, adolescence is characterized by a number of changes, including neurodevelopments such as the improvement of executive functioning and its associated regions, such as the prefrontal cortex;

additional changes may involve the endocannabinoid system. These changes increase adolescents' susceptibility to risky behaviors, such as drug use, and make this a particularly delicate time. Some neurocognitive deficits are associated with weekly to daily marijuana use, including deficits in attention, executive functioning, impulsive behavior and inhibition, psychomotor speed, visuospatial memory, verbal memory, and intelligence. When comparing adolescents who began using at a younger age to those who began later, we find significant differences in the previously stated functions (Wright & Lisdahl, 2017).

Furthermore, cannabis has been linked to various psychological disorders. Firstly, some meta-analyses have demonstrated that frequent consumers have a greater risk of developing psychosis, as well as an earlier age of onset for this mental disorder; it can also worsen their development. Secondly, it has also been linked to an increased risk of major depression. Lastly, marijuana use can also influence suicidal ideation and behavior (Carr et al., 2022).

In the previous section, it was stated that male and female prevalence statistics differ. The findings also demonstrate gender differences in the consequences of cannabis use. Men with an addiction to this substance are more likely to struggle with other addictive substances and present a more antisocial diagnosis. On the other hand, cannabis-dependent women are more prone to panic attacks and anxiety diagnosis (Rial et al., 2021).

1.5. Risk factors for cannabis use among adolescents

Cannabis is the drug most commonly used by adolescents and young adults (Rial 2021). In the past 20 years, it has been reported that 6.5% of adolescents aged 17 to 19 use daily (Wright, & Lisdahl, 2017).

Multiple factors that interact with the individual, the family, peers, and the community have been demonstrated to initiate drug use today. There are a few predictors of initiation related to family factors, such as family conflicts, a distant relationship with raising deficits, and parental psychopathology. Consequently, adolescents who experience negative interactions with their family, such as poor communication, conflicts, and difficulties in establishing rules and limits, have a greater likelihood of engaging in drug use in the

future. Choquet et al. (2008) concluded that specific restrictions on the use of cannabis within the family environment are positively associated with a reduction in substance use; there is a clear negative relationship between parental control and the use of alcohol, tobacco, and cannabis. A second important risk factor for early marijuana use is exposure to a family system in which the parents are also consumers; adolescents who find themselves in this circumstance have a high prevalence of using the same drug. In addition, other risk factors for substance abuse include a higher parental income, parental divorce, or more manageable factors such as the frequency and the arrival time of friend meetings (Carr et al., 2022).

In addition, sexual orientation and gender identity can play a significant role in determining cannabis use prevalence. Some risk factors, such as victimization, psychological stress, family situation, and lack of support, contribute to the increased likelihood of substance abuse among transgender people. As for bisexual and homosexual people, they also exhibit a higher prevalence of consumption compared to young adults who are heterosexual (Carr et al., 2022).

Prenatal exposure to the substance, publicity and media exposure, and social norms are additional risk factors for adolescents that must be considered. Several studies indicate that adolescent exposure to medicinal marijuana advertising increases the likelihood of subsequent use (Carr et al., 2022).

The opinion and influence of peers and friends is one of the most significant influences on the use of cannabis at a young age, in addition to the previously mentioned risk factors. This substance is known as a social drug due to its frequent use with friends, particularly during this phase of life. Late childhood, adolescence, and early adulthood are the stages during which friends exert the most influence; conveniently, these are also the stages during which cannabis consumption is highest. Initiation into this substance almost never happens when teens are alone, instead, they are always influenced by their peers. If we then fast-forward to middle and late adolescence, we can observe that this influence remains (Boman & Heck, 2017).

Lastly, although it is uncommon, there are some adolescents who consume cannabis alone. There are a number of specific risk factors associated with it,

including an earlier onset, a more intense use, negative emotions, coping motives, and positive expectations of the consume. Moreover, a pattern of more intense and problematic substance use is associated with a strategy for coping with emotional distress (Carr et al., 2022).

After researching previous reviews on this topic, a few systematic reviews assessing this literature were discovered. However, it is worth noting that authors such as Creemers, et al. (2009) focus on analyzing only a few possible risk variables, such as temperamental risk factors; thereby, a wider systematic review is required to evaluate this topic.

1.6. The importance of prevention of cannabis consume in adolescence

As we have seen in the previous sections, it is crucial to develop and implement effective prevention programs during early adolescence, as this is when cannabis use typically begins. Developing these in a school context is essential in order to modify the expectations, beliefs, and behaviors related to substance use prior to their establishment (Carr et al., 2022). Specifically in Europe, Australia, and Canada, the most recommended age range for intervention is between 14 and 15 years old. On the other hand, it may be necessary to intervene at a younger age in the United States, due to the fact that the starting age of consumption is 13. Some reasons for the implementation of this prevention program in a school setting include the fact that this should be targeted to this age group because their expectations and beliefs on the subject are not yet fully formed; this context can also be a good opportunity to reach a larger number of adolescents; also, many countries have the ability to implement these educational programs; and finally, this age range can be beneficial because students begin to experience the exposure to cannabis (Ariza et al., 2017).

There are different types of preventions that can be implemented in this context. On the one hand, there are universal programs that target the general adolescent population. On the other hand, there are selective programs that target a subset of adolescents who may be at a higher risk for substance abuse. In addition to these two types, programs can be interactive, allowing students to discuss the content they are learning with their

classmates, or noninteractive, focusing on a one-way communication between the teacher and the students. The program deliverers are another significant factor that has demonstrated differences in the effectiveness of prevention plans. It is believed that preventions led by non-teachers have a greater impact on adolescents than those led by teachers. For this reason, it is essential to pay close attention to the teachers and to provide them with proper training and support from prevention specialists in order to maximize the benefits of these plans. Due to the ineffectiveness of doses smaller than 10 sessions per group, the final factor that must be controlled is the duration of exposure to these prevention programs (Ariza et al., 2017).

In addition to implementing this prevention in schools, we must use a multimodal approach that includes family, peers, and the community in order to control as many risk factors as possible. Lastly, media campaigns have a significant impact on cannabis use among this age group and should be utilized as a tool for preventing the initiation of cannabis use (Connor et al., 2021).

In summary, we've seen how adolescence is a period of constant biological and psychological changes, where elements such as abstract thinking, imaginary audience and personal fables take place. These makes this an extremely sensitive period for teens, as their peers opinions start to become very significant to them. In this period of time, several risk factors such as parental problems, the discovery of sexual orientation and gender identity, and peer influence, might evolve into risk-taking behaviours, primarily substance use. The most common drug among this age group is cannabis, which is a highly addictive narcotic. This consumption can have harmful repercussions, including neurocognitive deficits and numerous psychological disorders. It is for this reason that prevention plans are essential, especially among school contexts. To be able to design these prevention programs, it is crucial to assess all the possible risk factors that take place among adolescents and be able to regulate them. We believe a suitable method of evaluating this risk variables is through a systematic review of all the relevant research there is until now regarding this topic. There is not any updated systematic review of potential risk for cannabis use among adolescents.

2. Objectives

The objective of this review is to assess the risk factors associated to the consume of cannabis among teens between 10 to 21 years old.

3. Methods

3.1. Inclusion and exclusion criteria

The following criteria will be used to select the studies that will be analyzed in this systematic review.

Table 1

Inclusion and Exclusion criteria

Date	Not restricted to a specific date, from inception to the date of search
Exposure of interest	Use of cannabis, not included articles that evaluate drug abuse or substance use disorder
Geographic location of study	Included all developed countries
Language	Studies done in English and Spanish
Participants	Adolescents: age range of 10 to 21 years old
Text access	Only including articles with free access to the full text
Type of publication	Original empirical studies that explore the association in a quantitate level; reviews, editorials and letters excluded
Type of studies	Longitudinal and transversal studies included

3.2. Search methods for identification of studies

To identify the studies that were analyzed in this review, two different databases were used: PubMed and Medline. As for the search strategy, ("risk" or "progno*" or "predict*") and "cannabis" and ("youth" or "adolesc*"), were applied. Filters that help us to only obtain articles in Spanish and in English were also used. In the PubMed database, the filter Free full access was applied; in Medline, the filter peer reviewed was also used.

After applying the search strategy to both databases, duplicates were deleted, and each article's title and abstract were then reviewed. All remaining titles and abstracts were then subject to a full-text evaluation.

To select the studies that meet the previously stated criteria, and to eliminate duplicates, Mendeley Reference Manager was used.

3.3. Extraction information

To extract the following variables from the previously selected research, an Excel-based extraction form was developed. A pilot test was conducted with a small number of studies to ensure that it was adequate and that no relevant variables were omitted.

Table 2

Variables extracted

Analyzed Variables
○ Authors and publication year
○ Sample: size, age range of participants and average age
○ Type of study
○ Country
○ Type of population: general population vs specific population
○ Recruitment strategies
○ Potential risk factor

- Method/ measure used to evaluate potential risk factor
- Results: No relationship vs relationship and positive vs negative relationship

3.4. Data synthesis

To elaborate the data synthesis the prior list was used to resume the information extracted and then it was quantified how many of the studies selected found relationships with the potential risk factors, how many found positive relationships and how many found negative ones. When discrepancies were found among results obtained from included studies exploring the same potential risk factor, we explored potential variables that could explain the discrepancies between results. This data synthesis was done using the Excel program.

3.5. Risk of bias

To be able to assess the potential biases within the studies included in this review, this next list of potential bias is going to be used. To elaborate this list, the article *Evaluation of the quality of prognosis studies in systematic reviews* (Hayden & Bombardier, 2006) was used. Each bias had four possible responses: Yes, No, Partly, Unsure.

- Study participation: The study sample adequately represents the population of interest with regard to important features, hence minimizing the possibility of bias in the results.
- Study attrition: Loss to follow-up (from sample to study population) is not associated with essential attributes (i.e., the research data adequately represent the sample), hence minimizing the possibility of bias.
- Prognostic factor measurement: The prognostic factor of interest is accurately assessed among study participants in order to adequately limit the possible bias.
- Outcome measurement: The outcome of interest is adequately measured among study participants in order to adequately restrict the potential for bias.

- Confounding measurement and account: Important possible confounders are carefully accounted for, thereby minimizing the possibility of bias in relation to the prognostic factor of interest.
- Analysis: The statistical analysis is appropriate for the study's design, minimizing the possibility of presenting inaccurate results.

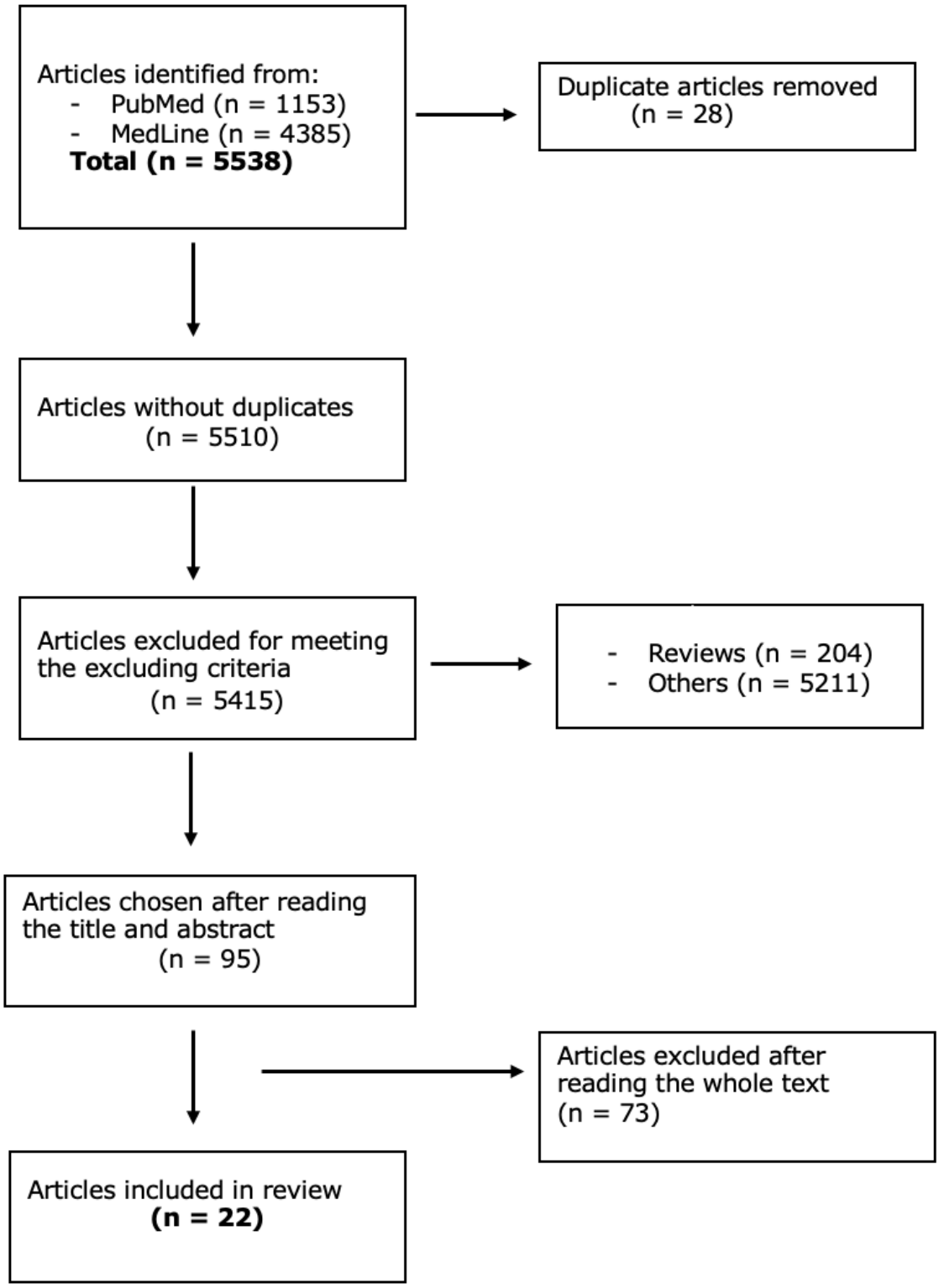
4. Results

4.1. Flow diagram

After selecting the inclusion and exclusion criteria from Table 1, the research strategy was applied to select the studies for this review. As shown in Figure 1, the initial search at PubMed and MedLine resulted in a total of 5538 articles; after removing duplicates and articles that met the exclusion criteria, 95 articles were selected to check for the title and abstract. In the end, 22 articles fulfilled the inclusion criteria and were included in this analysis.

Figure 1

Flow diagram



Source: original elaboration

4.2. List of variables

Secondly, a resume containing all the information from the selected studies and a list of the variables that will be analyzed in this section was developed. Table 3 contains the variables in question. After data extraction, each article's findings were assessed; articles that investigated the same factors were classified in Table 4, where the differences between findings were analyzed. Other risk factors were just researched in a single article and will therefore be evaluated separately.

In this review, the majority of our studies were cross-sectional (59%) and the median of our sample was N= 3406. Most studies were conducted in USA (36,4%), followed by Canada (13,6%), and participants came from a general population in 81,8% of the studies.

There were two risk factors for which a greater number of studies were conducted. Seven separate research studies (Hunt et, 201; Mason & Mennis, 2018; Karlsson et al, 2018; Bennett & Lewis, 2020), with the exception of one (Korhonen et al, 2008), indicated a positive correlation between being a boy and an increased probability of cannabis use. Korhonen et al. (2008), on the other hand, determined that there was a high correlation with female gender. This difference in results may be due to a possible bias in study participation, as we cannot confirm that their findings are applicable to countries other than Finland. The second most investigated risk factor was peer integration, with seven studies referencing it. In this case, there are no variations between the studies, as they all found a positive correlation between having a larger number of peers and substance use among friends.

Age was also found to be positively correlated with cannabis consumption, with all research indicating that a higher age is associated with increased risk of consuming cannabis (De Looze et, 2012; Nelemans et al, 2016; Ali et al, 2016; Glesheen et al, 2017; Bennett & Lewis, 2020). In the two studies that evaluated ethnicity, it was also determined to be a risk factor, with the conclusion that being non-white implied an increased risk of consuming (Tu et, 2008; Glasheen et al, 2017).

The majority of studies also found that economic position was a risk factor, indicating that a poorer life quality increased the likelihood of substance

abuse (Tu et al, 2008; Coomber et al, 2011; Glesheen et al, 2017). Despite the fact that we must consider a study by Korhonen et al. (2008) that found no correlation with this factor. This discrepancy may be explained by the possible bias of study participation, as we cannot ensure that their results may be applied to other groups, and by the variable of study type, as this was the only study to assess it longitudinally as opposed to cross-sectionally.

Family cohesion and structure, as well as parental care and support, were risk factors that, when examined across research, demonstrated a negative association (Veselska et al, 2009; De Looze et al, 2012). Family cohesion and structure generated an inconsistent conclusion, as the two cross-sectional studies found a negative correlation and one longitudinal study (Hunt et al., 2011) found no association. In addition to the type of study, this may also be explained by the evaluation of populations from different countries.

Parental control and parenting style were also explored in four separate research studies (Hunt et al, 2011; De Looze et al, 2012; Berge et al, 2016; Karlsson et al., 2018) but the results were less conclusive. Three of them found no correlation between cannabis usage and parental control (Hunt et al, 2011; De Looze et al, 2012; Berge et al, 2016) while one identified a negative correlation (Karlsson et al., 2018). This inconclusiveness can be explained by the fact that the last study (Karlsson et al., 2018) evaluated a specific item, particularly, parental ignorance regarding the locations of their children on Friday and Saturday nights. In addition, smoking-specific rules were found to have a negative correlation (De Looze et al, 2012).

When it comes to mental health and behavioral problems, links have been established. Specifically, when discussing mental health disorders, all five research studies (Tu et al, 2008; Glasheen, 2017; Bennet & Lewis, 2020; Dumas et al, 2020; Davis et al, 2021) showed that there was a negative relationship, which suggests that certain disorders such as social anxiety disorder, depressive symptoms, and major depressive episodes can act as risk factors. Regarding behavioral and emotional issues (Korhonen et al, 2008; Mason & Mennis, 2018) however, no correlation was identified when explored in two studies, with the exception of aggressiveness among boys, which corresponded positively as a risk factor (Korhonen et al., 2008).

Another risk factor with inconsistent results is self-esteem. One study identified a negative association between self-esteem among males (Veselska et al., 2009), while another study found a positive relationship with satisfaction with themselves (Tu et al., 2008). Different self-esteem measurements can explain this variation.

Two separate research studies revealed no link between prenatal substance exposure and marijuana consumption (Korhonen et al, 2008; Bennett & Lewis, 2020). However, four separate studies indicated a significant correlation between other substance use among teenagers and a higher risk of cannabis use (Tu et al, 2008; Korhonen et al, 2008; Berge et al, 2016; Karlsson et al, 2018).

On a separate note, rural location was the subject of two separate investigations with contradictory findings. Coomber et al. (2011) identified this as a risk factor for cannabis use, however Glasheen et al. (2017) identified a negative correlation. These variations can be explained by the fact that both studies analyze two distinct age ranges, with the first evaluating those aged 12 to 15 and the second evaluating those aged 14 to 20. This last one also assessed a particular population, but the previous one applied to the general population.

Additionally, sensation-seeking has been evaluated in two additional studies. Ali et al. (2016) showed a positive correlation, however Palma et al. (2021) found no correlation. The contrast in results may be explained by the fact that the more recent study focused on a specific group, whereas the other focused on the general population, and by the fact that they analyzed people from two separate countries.

Two studies analyzed the effects of watching television, videos, and DVDs. The longitudinal study by Hunt et al. (2011) found no correlation, however the cross-sectional study by Kaur et al. (2020) indicated a negative correlation with weekend video viewing. These discrepancies can be attributed to the varying measures of items, as well as the different countries and types of studies.

Two studies that examined the relationship between social media use and texting found a positive association. They also found no correlation with online gaming, online shopping, or music streaming. Kellenghan et al. (2020) found no relationship with video chatting, however Kaur et al. (2020) discovered a positive relationship. We must consider the heterogeneity between the types of studies and the potential bias of study participation for each.

In addition, we will now examine several risk factors that were explored in a single article. First, Tu et al. (2008) showed no correlation with physical health, but a negative correlation with family and school satisfaction as well as academic success. Second, Korhonen et al. (2008) discovered a positive association between parental substance abuse, particularly weekly "binge drinking" by the fathers.

Thirdly, Hunt et al. (2011) found a positive correlation between exposure to film portrayals of illicit drug use and subsequent cannabis consumption, as well as self-perception as a risk-taker and rule-breaker. Regarding the same topic, Bennet and Lewis (2020) determined that there was no correlation between exposure to violence and exposure to drugs.

Fourthly, Vaughn et al. (2015) focused on the homeschool status of adolescents and found a negative effect after controlling for sociodemographic characteristics.

The influence of personality on adolescent consumption is an additional aspect that must be addressed. Gonzálvez et al. (2016) discovered a connection, including a positive correlation with sensitivity, openness to experience, and perfectionism; and a negative association with serenity, friendliness, gregariousness, and trust. In addition, Ali et al. (2016) stated that hopelessness, negative thinking, and impulsivity must also be included as risk factors.

In the same year, Berge et al. (2016) observed a positive association between both deviant peers and delinquency, and cannabis consume.

On a separate note, in 2017, Glasheen et al. researched a specific population, residents of households and noninstitutional group quarters, as well as

civilians living on military bases, to see how their living circumstances impacted their marijuana consumption. They discovered diverse findings for various age groups. First, there was a positive correlation between both residential transience and mobility, and cannabis use, among 12 to 17-year-old adolescents. On the other hand, they discovered no connection between 18- to 20-year-olds. In the same study, 18- to 20-year-olds had a positive relationship with work, school enrollment, and health insurance status, and 12- to 13-year-olds had a positive relationship with home mobility and previous year major depressive episodes.

Boyes, R., et al. (2017) investigated a rarely explored risk factor for cannabis use among 14- to 15-year-old adolescents. They focused on the physical and social aspects of sports participation. Even while no correlation was observed between individual sports and either high social or high physical engagement among males, a positive correlation was discovered between both high social and high physical involvement in sports among this same gender. Girls, on the other hand, had a lower risk of cannabis use when participating in individual sports, only team sports and both individual and team sports; they also had no relationship with high physical involvement in team sports and cannabis consume; but they did have a positive relationship when there was a high social involvement and a low physical involvement.

Furthermore, Mason and Mennis (2018) examined the association of cannabis usage with both neighborhood disorder and preferred activity space in a longitudinal study. At baseline, they found no association between city site as a favorite and cannabis usage. However, at a 12 and 24 month-follow up, this factor became a risk factor. Similarly, peer network health was found to have a negative correlation with cannabis use at 12 and 24 month-follow up. Neighborhood disorder, on the other hand, showed a positive relationship at baseline, but none at 12 and 24 month-follow up. Moreover, they identified a positive connection of both a risky peer network and emotional dysregulation with this substance use at baseline.

Karlsson, P., et al. (2018) were measuring school connectedness when they discovered a positive correlation between absenteeism in class, dissatisfaction with school, and cannabis use, and a negative correlation

between risk perceptions and substance use. When they analyzed the risk aspects related with the classroom, they discovered that higher proportions of students with low-risk perceptions and engaging in truancy constituted a significant cannabis consumption risk. Lastly, they discovered a positive correlation with the amount of females in the classroom, but this conclusion it's only applicable to adolescents in upper secondary school.

Also relating to school connectedness, Moore, G., et al. (2018) discovered a positive correlation between cannabis usage and both reduced parental support and a high degree of peer support. They were unable to establish a correlation with peer connectedness in the school setting or with both the interaction of family and teacher support. Due to the possibility of a study participation bias, the results should be interpreted with caution; they may not be applicable to populations outside the United Kingdom.

Bennett, D., and Lewis, M. (2020), apart from the findings previously stated such as gender or age, also found a positive relationship with having a positive attitude toward drugs.

On another note, Covid-19 has had a significant impact on people's life during the past two years, but little is known about its specific effects on adolescents. In order to analyze the impact of this virus, Dumas, T., et al. (2020) decided to conduct a longitudinal study. They came to the conclusion that there was a negative correlation with post-Covid users among females, but that their frequency had grown. Among this gender, a positive correlation was discovered with substance use with parents, as well as an increased probability of sending posts of substance use to peers. Those adolescents who used cannabis in the presence of their parents were at a reduced risk of consuming large quantities. In addition, there was a positive correlation with post-Covid solitary cannabis use by individuals of both sexes. This was positively correlated with both an elevated Covid-19 fear and depressed symptomatology. On the other hand, among boys, a positive relationship with an increased amount of cannabis consumption was found among those who use alone and face-to-face with peers during Covid-19 pandemic.

In 2021, two additional studies analyzed specific groups of adolescents. First, Palma et al. (2021) assessed the vulnerability context and its impact on

cannabis consumption. They discovered a positive correlation with teenagers who participated in special training and insertion programs compared to those who engaged in community entities. In addition, they discovered a positive correlation between negative consumption expectations among girls compared to boys, as well as a positive correlation between problematic cannabis consumption and special training and insertion programs, positive consumption expectations, and the perception that peers consume. In addition, the second longitudinal study, done by David et al. (2021), examined the effect of sexual harassment victimization among LGBTQ adolescents on their subsequent cannabis use. They concluded that there is a positive correlation between verbal aggression victimization and cannabis intake, as well as a positive relation between cannabis use and homophobic name-calling. On a separate note, they discovered that the presence of both depressive symptoms and verbal victimization or homophobic name-calling was a risk factor for this substance use.

Table 3

Analyzed Variables

Authors and Publication year	**Sample**	**Type of study**	**Country**	**Type of population and recruitment strategies**	**Potential risk factor**	**Method used to evaluate potential risk factor**	**Results**
Tu, A., Ratner P., & Johnson J. (2008)	N= 8225 Age range: 12-18 Average age: Not specified	Cross-sectional study	Canada	General population. Non-random and random recruitment strategies.	Sociodemographic factors: grade, ethnicity, and economic status	Self-assessment test.	Positive relationship among boys with grade and ethnicity (Aboriginal). Negative relationship with self-reported economic status. Positive relationship with other substance use.
					Health status: physical health, mental health	Self-assessment test.	No relationship with physical health. Negative relationship among girls with mental health.
					Life satisfaction	Four facets of the Multidimensional Students' Life Satisfaction Scale (MSLSS).	Positive relationship with satisfaction with themselves. Negative relationship with satisfaction with families and school.
					Academic performance	Self-assessment test.	Negative relationship with academic performance.
					Peer integration	Self-assessment test.	Positive relationship with peer integration.
					Other substance use: cigarette use, alcohol use	Self-assessment test.	Positive relationship with other substance use.
	N= 3118		Finland		Gender	Self-assessment test.	Positive relationship with gender (female).

Korhonen, T., Huizink A., Dick D., Pulkkinen L., Rose R., & Kaprio J. (2008)	Age range: 11-17.5 Average age: Not specified	Longitudinal study		General population. Following five birth cohorts.	Individual factors: other substance use and behavioral and emotional problems	Self-assessment test.	Positive relationship with other substance use (early onset of cigarette smoking and drinking to intoxication). Positive relationship with aggressive behavioral problems among boys. No relationship with externalizing and internalizing behavior.
					Peer factors: substance use among friends	The Multidimensional Peer Nomination Inventory (MPNI)	Positive relationship with substance use among friends (having more than five smoking friends and having any acquaintances who had experimented with cannabis).
					Family factors: parental substance use, parents' socio-economic status, pre-natal exposure to nicotine	Self-assessment test.	Positive relationship with parental substance use (father's weekly "binge drinking"). No relationship with economic status and pre-natal exposure to nicotine.
Veselska, Z., Geckova, A., Orosova, o., Gajdosova, B., Van Dijik, J., & Reijneveld, S. (2009)	N=3694 Age range: 11-17 Average age:14.3	Cross-sectional study	Slovakia	General population. Sample obtained from different major and small cities from different parts of the country.	Self-esteem	Rosenberg Self-esteem scale (RSES).	Positive relationship among boys only with negative self-esteem. No relationship among girls with both positive and negative self-esteem.
					Resilience: structured style, social competence, and family cohesion	Self-assessment test.	Negative relationship among both genders with structured style and family cohesion. Positive relationship among both genders with social competence.
Coomber, K., Toumbourou,	N=5769		United States	General population.	Socioeconomic status	Self-assessment test.	Negative relationship with socioeconomic status.

J., Miller, P., Staiger, P., Hemphill, S., & Catalano, R. (2011)	Age range: 12-15 Average age:14	Cross-sectional study	(Washington State) and (Victoria) Australia	Random recruitment strategies.	Location definition	Self-assessment test.	Positive relationship with location (rural areas). No relationship with location comparison from urban areas to regional areas. Positive relationship with location (Washington State).
Hunt, K., Sweeting, H., Sargent, J., Lewars, H., Young, R., & West, P. (2011)	N=1006 Age range: 11-19 Average age: Not specified	Longitudinal study	United Kingdom (West of Scotland)	General population. Random recruitment strategies.	Gender	Self-assessment test.	Positive relationship among male gender.
					Exposure to alcohol and drug-taking in films.	Self-assessment test.	Positive relationship with exposure to film images of illicit drug use.
					Parental structure. Parental care	Self-assessment test. Brief Parental Bonding Instrument (PBI).	No relationship with parental structure. Negative relationship with parental care.
					Attitudes to risk and rule-breaking	Self-assessment test.	Positive relationship with perceiving oneself as a risk-taker and rule-breaker.
					TV, video and dvd use	Self-assessment test.	No relationship with hours per week watching television, videos or dvds.
					Parental control	Self-assessment test.	No relationship with parental control
					Friends' alcohol and drug use	Self-assessment test.	Positive relationship with friends' alcohol and drug use.
De Looze, M., Van den Eijnden, R., Verdurmen, J., Vermeulen-Smit, E., Schulten, I., Vollebergh,	N=5642 Age range: 12-16 Average age: 13.8	Cross-sectional study	The Netherlands	General population. Random recruitment strategies.	Age	Self-assessment test.	Positive relationship with age.
					Parental support	Self-assessment test.	Negative relationship with parental support.
					Parental control	Self-assessment test.	No relationship with parental control.

W., & Ter Bogt, T. (2012)					Smoking-specific rules	Self-assessment test.	Negative relationship with parental rules on smoking.
Vaughn, M., Salas-Wright, C., Kremer, K., Maynard, B., Roberts, G., & Vaughn, S. (2015)	N=200824 Age range: 12-17 Average age: Not specified	Cross-sectional study	United States	General population. Multistage area probability sampling methods.	Homeschool status	Self-assessment test.	Negative relationship with homeschooled adolescents.
Gonzálvez, M., Espada, J., Guillén-Riquelme, A., Secades, R., & Orgilés, M. (2016)	N=1455 Age range: 14-18 Average age: 14.96	Cross-sectional study	Spain	General population. Incidental sampling	Personality: warmth, stability, gregariousness, friendliness, sensitivity, trust, openness to experience, sociability, perfectionism, and calmness	Self-assessment test. Adapted version of the scales of the Sixteen Personality Factor Questionnaire (16PF-IPIP) to an orientation context.	Relationship with personality traits. Positive relationship with sensitivity, openness to experience and perfectionism. Negative relationship with calmness, friendliness, gregariousness, and trust.
Nelemans, S., Hale, W., Raaijmakers, Q., Branje, S., Van Lier, P., & Meeus, W. (2016)	N=497 Age range: 13-18 Average age: 13.03 at the beginning of the study	Longitudinal study	The Netherlands	General population. Random recruitment strategies.	Age	Self-assessment test.	Positive relationship with age.
					Social Anxiety Disorder (SAD)	4 items of the Dutch version of Screen for Child Anxiety Related Emotional Disorders (SCARED).	Negative relationship with SAD symptoms.
					Peer involvement	5 items of "intensity of contact with friends" subscale of the Questionnaire on Peer Relationships.	Positive relationship with peer involvement.
Berge, J., Sundel, K., Ojehagen, A., &	N=1268 Age range: 13-16	Longitudinal study	Sweden	General population.	Parenting styles: responsiveness and demandingness.	Self-assessment test.	No relationship with parenting styles.
					Deviant peers	Self-assessment test.	Positive relationship with deviant peers and having been drunk at baseline.

Hakansson, A. (2016)	Average age: Not specified				Adolescent delinquency	Self-assessment test.	Positive relationship with delinquency.
Ali, A., Carré, A., Hassler, C., Spilka, S., Vanier, A., Barry, C., & Berthoz, S. (2016)	N=5069 Age range: 14-20 Average age: Not specified	Cross-sectional study	France	General population. Random recruitment strategies.	Age	Self-assessment test.	Positive relationship with gender (boys).
					Hopelessness/ Negative thinking	Substance Use Risk Profile Scales (SURPS).	Positive relationship with hopelessness/negative thinking.
					Impulsivity	Substance Use Risk Profile Scales (SURPS).	Positive relationship with impulsivity.
					Sensation seeking	Substance Use Risk Profile Scales (SURPS).	Positive relationship with sensation seeking.
					Anxiety sensitivity	Substance Use Risk Profile Scales (SURPS).	Negative relationship among girls only with anxiety sensitivity.
Glasheen, C., Forman-Hoffman, V., & Williams, J. (2017)	N=95625 Age range: 12-20 Average age: Not specified	Cross-sectional study	United States	Specific population. Residents of households and noninstitutional group quarters, and civilians living on military bases.	Sociodemographic factors: sex, age and race/ethnicity, poverty status	Self-assessment test.	Positive relationship with age and race/ethnicity (non-Hispanic white). Positive relationship with gender (male) among 18 to 20 years old. Positive relationship with poverty among older adolescents (16-17 years old).
					Health insurance status	Self-assessment test.	Positive relationship with health insurance status among 18 to 20 years old.
					Residential mobility and residential transience	Self-assessment test.	Positive relationship with residential transience and mobility among adolescents (12-17 years old). No relationship with residential transience and mobility among young adults (18-20 years old). Positive relationship with age Positive relationship among young adolescents (12-13 years old) with both residential mobility and past year MDE.

					Metropolitan area	Self-assessment test.	Negative relationship with living in a rural area among adolescents from 14 to 20 years old.
					Mother and father living in the household	Self-assessment test.	Negative relationship with mother living in the household, father in the household among adolescents from 12 to 17 years old.
					School enrollment or employment status	Self-assessment test.	Positive relationship with employment or school enrollment among 18 to 20 years old.
					Past year major depressive episodes (MDE)	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.	Positive relationship with gender (male) among 18 to 20 years old.
Boyes, R., O'Sullivan, D., Linden, B., Mclsaac, M., & Pickett, W. (2017)	N=13817 Age range: 14-15 Average age: Not specified	Cross-sectional study	Canada	General population. Non- random recruitment strategies.	Involvement in sport: physical involvement and social involvement	Self-assessment test.	No relationship with individual sport participation among boys. Negative relationship with individual sport participation, only team sport participation, and both individual and team sport participation among girls. No relationship with only high social or only high physical involvement in sport among boys. Positive relationship with both high social and high physical involvement in sports among boys. Positive relationship with only high social involvement in team sports among girls. No relationship with only high physical involvement in team sports among girls. Positive relationship with both high social involvement and low physical involvement among girls.

Mason, M., & Mennis, J. (2018)	N=248 Age range: 13-16 Average age: 13.4 at the beginning of the study	Longitudinal study	United States	General population. Non-random recruitment strategies.	Gender	Self-assessment test.	Positive relationship with gender (male) at 12 month.
					Activity space	Self-assessment test.	No relationship with city place as favorite at baseline. Positive relationship with city place as favorite at 12 and 24 months.
					Neighborhood disorder	Self-assessment test.	Positive relationship with neighborhood disorder at baseline. No relationship with neighborhood disorder at 12 and 24 months.
					Emotional dysregulation	Dysregulation Inventory (DI).	Positive relationship with both risky peer network and emotional dysregulation at baseline. No relationship with emotional dysregulation at 12 and 24 months.
					Peer network health	Adolescent Social Network Assessment (ASNA).	No relationship with peer network at baseline. Positive relationship with risky peer network at 12 and 24 months.
Karlsson, P., Ekendahl, M., Gripe, I., & Raninen, J. (2018)	N=28729 Age range: 15-18 Average age: Not specified	Cross-sectional study	Sweden	General population. Not specified recruitment strategies.	Gender	Self-assessment test.	Positive relationship with gender (male).
					Risk perceptions	Self-assessment test.	Negative relationship with risk perceptions.
					Early substance use debut	Self-assessment test.	Positive relationship with early substance use debut.
					Parental approval of substance use	Self-assessment test.	Positive relationship with parents approving tobacco use.
					Parental monitoring	Self-assessment test.	Positive relationship with parental ignorance about their children's

							whereabouts on Friday and Saturday nights.
					School connectedness	Self-assessment test.	Positive relationship with truancy and dissatisfaction with school. Positive relationship with higher proportions of students in the school class holding low risk perceptions and engaging in truancy. Positive relationship with the proportion of females in the classroom (significant for upper secondary school students).
Moore, G., Cox, R., Evans, R., Hallingberg, B., Hawkins, J., Littlecott, H., Long, S., & Murphy, S. (2018)	N=9055 Age range: 11-16 Average age: 13.7	Cross-sectional study	United Kingdom (Wales)	General population. Random recruitment strategies.	Family relationships	Family Affluence Scale.	Negative relationship with family support. No relationship with both the interaction of family support and teacher support. Positive relationship with both less family support and a high degree of support from friends.
					Support from friends	Self-assessment test.	Positive relationship with support from friends.
					School connectedness	Self-assessment test.	No relationship with peer connectedness in the school environment.
Bennett, D., & Lewis, M. (2020)	N=150 Age range: 15-17 Average age: 15.32-15.76-16.22-16.76-	Longitudinal study	United States	Specific population. Not specified recruitment strategies.	Gender	Self-assessment test.	Positive relationship with gender (male).
					Prenatal substance exposure	Social Environment Inventory. Family Chaos Scale.	No relationship with prenatal cocaine exposure. No relationship with prenatal exposure to alcohol, tobacco and cannabis.
					Friends drug use	Self-assessment test.	Positive relationship with having more friends who used substances.

	17.14-17.73 at each follow-up.				Positive attitude toward drugs	Youth Risk Behavior Survey (YRBS).	Positive relationship with having a positive attitude toward drugs.
					Age	Self-assessment test.	Positive relationship with age.
					Adolescent depressive symptoms	Beck Depression Inventory-II (BDI-II).	Positive relationship with depressive symptoms.
					Parents upset if use drugs or otherwise violate rules	Self-assessment test.	Negative relationship with perceiving one's parents to be upset by substance use.
					Violence exposure	Screen for Adolescent Violence Exposure (SAVE).	No relationship with violence exposure.
Dumas, T., Ellis, W., & Litt, D. (2020)	N=1054 Age range: 14-18 Average age: 16.68	Longitudinal study	Canada	General population. Recruited via Instagram advertisement.	Effects of COVID-19	Self-assessment test.	Negative relationship with post-COVID consumers among girls only. Positive relationship with post-COVID cannabis consume frequency among girls only.
					Type of consume: alone, face-to-face, with parents	Self-assessment test.	Positive relationship with post-COVID solitary use. Positive relationship with alone use and face-to-face with peers among boys. Negative relationship with adolescents who used substance with parents.
					Self-reported popularity	Self-assessment test.	Positive relationship between the interaction of self-reported popularity and peer substance use during COVID-19 pandemic. Positive relationship between the interaction of popularity and solitary substance use. Negative relationship between the interaction of popularity and face-to-face substance use with peers.

					Depression, anxiety, and fear of COVID-19 virus	Self-assessment test. Brief Symptom Inventory.	Positive relationship between the interaction of solitary substance use and both increased COVID-19 fears and depressive symptomology.
Kelleghan, A., Leventhal, A., Cruz, T., Bello, M., Liu, F., Unger, J., Riehm, K., Cho, J., Kirkpatrick, M., McConnell, R., & Barrington-Trimis, J. (2020)	N=1978 Age range: 16-19 Average age: 16.5 at baseline.	Longitudinal study	United States	General population. Not specified recruitment strategies.	Digital media use	Self-assessment test.	Positive relationship with social media posting. Positive relationship with checking social media sites and texting. Negative relationship with reading news/articles & browsing photos. No relationship with video chatting and online shopping, gaming, and streaming or downloading music.
Kaur, N., Rutherford, C., Martins, S., & Keyes, K. (2020)	N=44482 Age range: 13- 19 Average age: Not specified	Cross-sectional study	United States	General population. Random recruitment strategies.	Entertainment, social media, and cell phone use	Self-assessment test.	Positive relationship with social media, texting, talking and video chatting. No relationship with talking on the phone and gaming. Negative relationship with watching videos on the weekends.
Palma, D., Continente, X., López, M., Vázquez, N., Serral, G., & Ariza, C. (2021)	N=365 Age range: 16-21 Average age: 17.5	Cross-sectional study	Spain	Specific population. Vulnerability context. Not specified recruitment strategies.	Recruitment origin	Encuesta sobre Factores de Riesgo en Estudiantes de Secundaria (FRESC). Cannabis Abuse Screening Test (CAST). Substance Use Risk Profile Scale (SURPS).	Positive relationship with PFI (programa de formación e inserción) compared to EC (entidades comunitarias). Positive relationship between the interaction of problematic cannabis consume and PFI, presenting positive expectations of the consume and perceiving that peers consume.

					Cannabis consume expectations	Marijuana Effect Expectancy Questionnaire (MEEQ).	Positive relationship with negative consume expectations among girls compared to boys.
					Sensation seeking	Inventario de Búsqueda de Sensaciones de Arnett.	No relationship with sensation seeking.
Davis, J., Tucker, J., Dunbar, M., Pedersen, E., D'Amico, E. (2021)	N=2663 Age range:10 -19 Average age: 19.4 at the end of the study.	Longitudinal study	United States	Specific population. LGBTQ teens. Not specified recruitment strategies.	Verbal aggression victimization	Self-assessment test.	Positive relationship with verbal aggression victimization.
					Homophobic name-calling victimization	Homophobic Content Agent Target Scale.	Positive relationship with homophobic name-calling.
					Depressive symptoms	Self-assessment test.	Positive relationship with both depressive symptoms and high verbal victimization and homophobic name-calling.

Source: original elaboration

4.3. Data synthesis

Table 4

Data syntesis

Risk factor	**Number of studies**	**Positive relationship**	**Negative relationship**	**No relationship**	**Variables that may explain the discrepancies between results**
Male gender	7	6	1	0	• Different countries • Possible bias of study participation
Age	4	4	0	0	• No different results
Ethnicity	2	2	0	0	• No different results
Economic status	4	0	3	1	• Possible bias of study participation • Longitudinal vs cross-sectional study • Different countries
Mental health	5	0	5	0	• No different results
Peer integration and substance use among friends	7	7	0	0	• No different results
Other substance use	4	4	0	0	• No different results
Behavioral and emotional problems	2	1	0	1	• Only positive correlation with aggressiveness among boys
Pre-natal exposure to substances	2	0	0	2	• No different results
Self-esteem	2	1	1	0	• Different measures of self-esteem • Only negative correlation among boys
Family cohesion and structure	3	0	2	1	• Longitudinal vs cross-sectional study • Different countries
Rural location	2	1	1	0	• Specific vs general population • Different age range

Watching tv, videos and dvds	2	0	1	1	• Longitudinal vs cross-sectional study • Different countries
Social media use and texting	2	2	0	0	• No different results
Gaming	2	0	0	2	• No different results
Video chatting	2	1	0	1	• Longitudinal vs cross-sectional study • Possible bias of study participation
Parental support and care	3	0	3	0	• No different results
Parental control and parenting style	4	0	1	3	• Different measures of parental control
Smoking-specific rules	3	0	3	0	• No different results
Sensation seeking	2	1	0	1	• Different countries • Specific vs general population

4.4. Risk of bias

Parallel to this data synthesis and analysis, potential biases in all 22 studies were discovered. As seen in table 5 and figure 2, no article was able to pass all potential biases, as the majority only partially fulfilled the criteria. Considering the potential risk of bias analysis, we can observe that all the publications presented an adequate statistical analysis for the study's design and were able to restrict the possibility of invalid results. When examining the risk of bias of confounding measurements and account, the majority of the research took potential confounders into account, thereby limiting potential bias with each measured risk factor. On the other hand, only a few articles were able to adequately represent the population of interest with regards to essential characteristics; hence, not all results may be applied to other populations, as several studies only partially assessed this possible bias; for instance, Tu et al. (2008) remarked that their sample was drawn from a group with a higher prevalence of tobacco use; thus, only populations with similar characteristics can be compared. We can also see that the majority of longitudinal articles met the criteria to minimize the potential bias of study attrition, with a few exceptions. Lastly, prognostic factor assessments and outcome measurements were the most susceptible to bias, as the majority of articles acknowledged in their limitations some potential issues or areas for improvement, such as conducting a longitudinal study rather than a cross-sectional one.

The following legend chart corresponds to Table 5:

1: Study participation
2: Study attrition
3: Prognostic factor measurement
4: Outcome measurement
5: Confounding measurement and account
6: Analysis

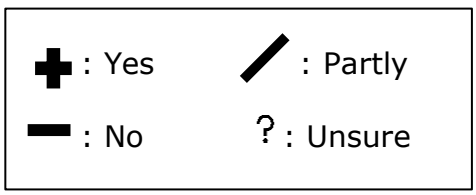


Table 5

Risk of bias

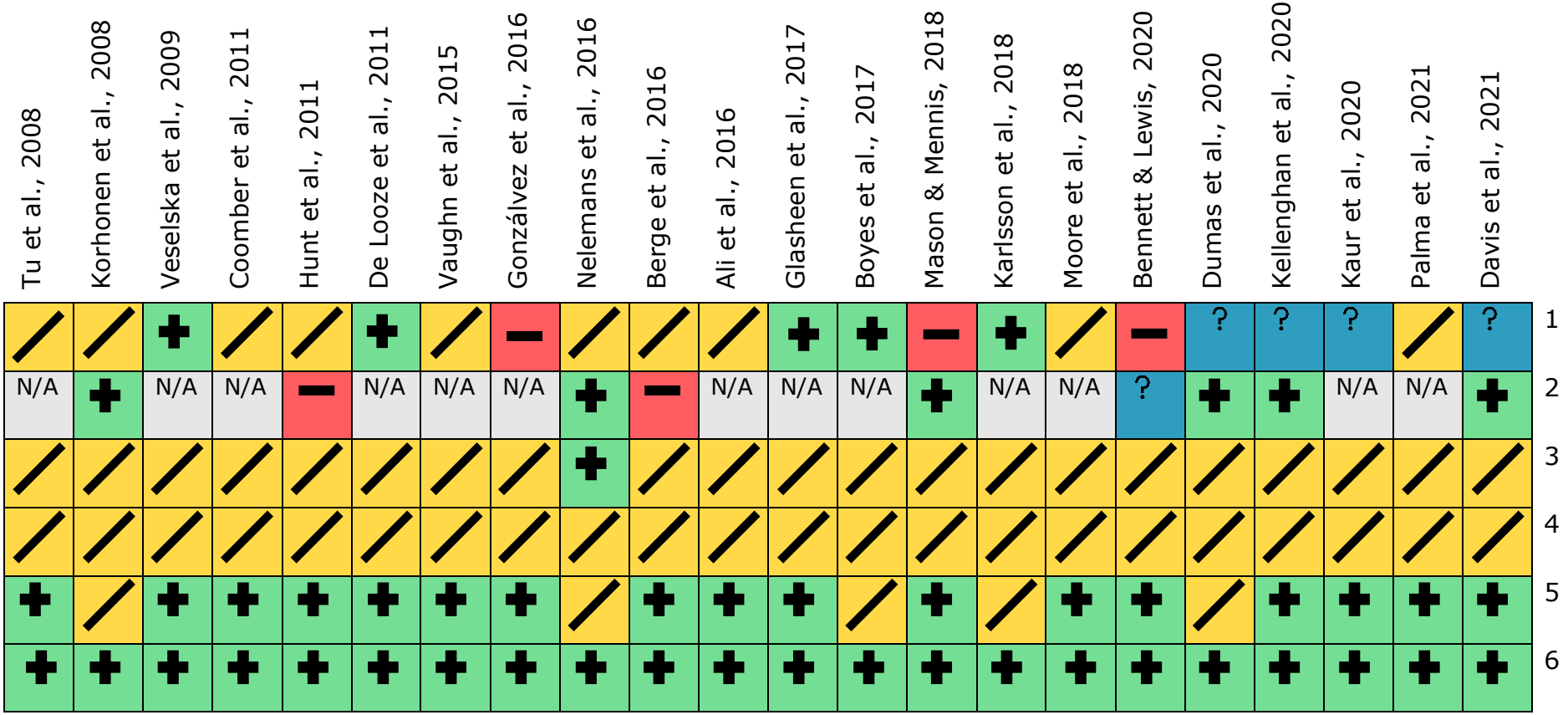
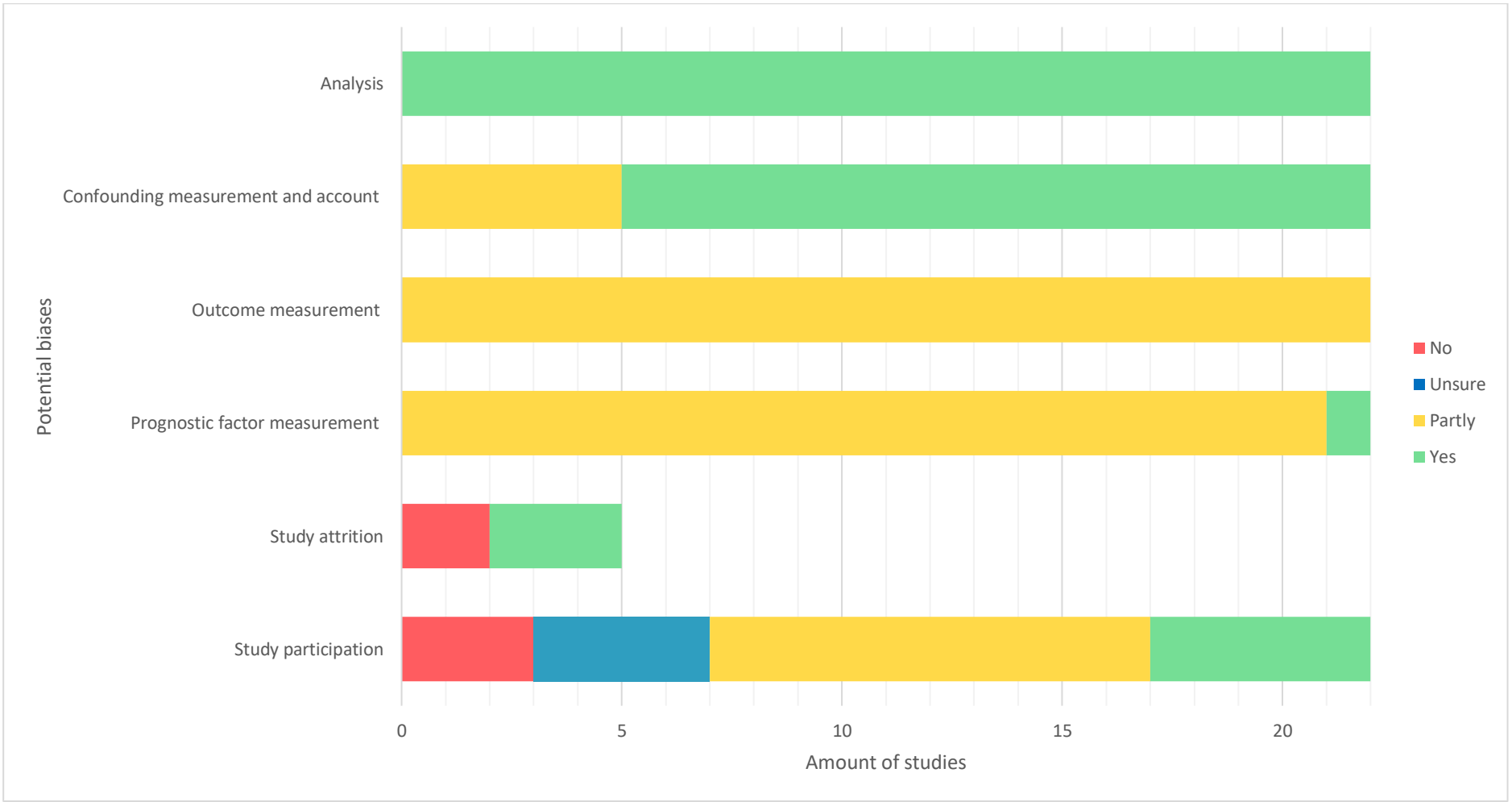


Figure 2

Risk of bias



5. Discussion

In total, more than 30 potential risk factors have been evaluated among the previous studies, and despite the fact that not all of the previous studies established consistent results, there were a number of significant risks that should be addressed in future research and prevention strategies.

Firstly, the literature consistently finds that gender influences teen consumption (e.g., Choquet, et al., 2007). Other sociodemographic variables, such as age, were also shown to have a positive relationship; numerous authors (Moffitt, 1993; Sloboda et al., 2012) claim that drug use prevalence rates are highest throughout late adolescence and early adulthood. One possible explanation for this phenomena could be the transition that most late adolescents undergo when entering college or the workplaces, where they begin to settle into less restrictive environments where drug access and substance use are more likely (Bachman et al., 1997; McCabe et al., 2005; Wechsler & Nelson, 2008).

Second, existing research (Armstrong & Costello, 2002) supports that mental disorders that have previously happened can become risk factors for substance abuse. On the same topic, Paton, et al. (1977) reported that cannabis use among adolescents could be a way to alleviate depressive symptoms.

The positive association between cannabis consumption and peer influence is also one of the most significant findings of this systematic review. Numerous authors, like Kandel, et al. (1978) and Kiesner, et al. (2010), agree with this conclusion, indicating that it is a strong predictor of consumption.

Not only friend relationships are important during this age, but family is also a big influence. Family coherence and structure, as well as parental care and support, can have a significant protective effect against the early use of cannabis. In contrast, several researchers have identified parental divorce, parental disagreement, inconsistent parental discipline, and lack of closeness as risk factors (Reily, 1979; Baumrind, 1985; Stoker and Swadi, 1990; Isohanni et al., 1991). In this review it was found that smoking-specific parental rules have a negative correlation with cannabis use. As preventative

measures, this information should be considered when supporting parents in developing improvements to the family dynamic.

Even though no association was found between prenatal exposure and adolescent substance use, it is important to consider the data of parental substance abuse while attempting to prevent youth drug use. Ishohanni et al. (1991) also studied this factor and found that teen smoking rates are higher among those whose parents smoke.

Future research should include other risk variables, such as cinematic portrayals of illegal drug use or social media use and texting, because this is an important problem nowadays. Not only in films, but also in television and social media, exposure to it is increasing, and suitable approach should be implemented. This review showed no correlation between violence and drug exposure; therefore, drug exposure appears to be a wider issue than violence in general.

Finally, sexual harassment victimization among LGBTQ adolescents, class absenteeism, and school dissatisfaction have also been proven to be associated with an increased risk of cannabis use; consequently, these should be taken into account while developing school preventive measures.

Furthermore, it is necessary to discuss the strengths and limitations of this systematic review. Initially, prior to the research, a rigorous methodology was established, with adequate inclusion and exclusion criteria; this research was also not limited by a date gap, which allowed to collect as much research as possible that has been conducted throughout the years. This methodology, including of a highly specific search strategy and filtering parameters, enables the replication of this review. In addition, the huge age gap between the participants is another strength, allowing us to see a transition between this time period. It is also worth noting the extensive list of variables that were studied, as this allowed to evaluate potential hypotheses for the differences in the articles. On the other hand, this article has significant limitations. To begin with, only two databases were considered for this research, which may have limited the amount of important information studied. Moreover, a larger number of articles would have allowed this review

to compare more data regarding the various risk factors analyzed, as some of them were only identify by a single study.

The findings of this systematic review can contribute to the creation of future prevention programs, that should consider as many risk factors as possible. It also helps to link previously elaborated research on this topic, acquire a clearer overview of all previous studies and guide future research. Future research of the previously stated factors must be conducted, as this review only touches on a small portion of a much bigger topic that is essential to the growth of modern society and future generations. Future research should focus on elaborating more longitudinal studies to corroborate our findings, as we have only been able to verify them with cross-sectional studies; and if most of the research just focuses on this type of study, we cannot corroborate hypothesis about cause-effect relationship. It is also necessary to elaborate more empirical studies with a major scientific rigor; and to try to avoid as many biases as possible.

6. Conclusions

This systematic review's primary purpose was to determine the risk factors associated with teenage cannabis consumption. After developing a protocol and implementing the search strategies, twenty-two articles were assessed. Among them, a large number of factors were identified and compared. Age, gender, peer influence, family structure and parental support, mental health, parental substance misuse, class absenteeism, and school discontent are among the most influential. Other variables investigated, including prenatal substance exposure and gaming, were shown to have no correlation. Finally, some factors with a negative relationship, including homeschooling and participation in individual and team sports among girls, were discovered.

7. References

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