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PREVENTION OF BINGE DRINKING IN YOUNG ADOLESCENTS THROUGH THE PROMOTION OF A BALANCED LEVEL OF PSYCHOLOGICAL WELL-BEING: BE-DRY

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ABSTRACT

This doctoral thesis presents a project carried out in secondary schools located in the city of Ferrara with the primary objective of demonstrating the effectiveness of an intervention based on Well-Being Therapy (Fava, 2016) in reducing alcohol use and improving lifestyles.

In the first chapter, as introduction, biological, social and psychological changes that occur during adolescence, with particular emphasis on risky behaviors and unhealthy lifestyle are presented. Data on European and Italian adolescents are also included.

In the second chapter, the phenomenon of binge drinking is described, particularly its definition, protective and risk factors, and associated variables.

In the third chapter, the concepts of hedonic and eudaimonic well-being are presented with particular reference to psychological well-being as defined by Carol Ryff. The Well-Being Therapy protocol by Fava (2016) is also depicted.

In the second part, which includes chapters four to six, the experimental study is presented. The primary objective was to test the efficacy of an intervention based on Well-Being Therapy to prevent or stem alcohol use, binge drinking, and other unhealthy lifestyle behaviors among Italian adolescents in the school setting. A three-arm cluster randomized controlled trial including three test periods (baseline, post-test, 6-month follow-up) was implemented. The study involved eleven classes (207 students) that were randomly assigned to receive well-being intervention (WBI), lifestyle intervention (LI) or not receive intervention (NI). Students were assessed on specific variables including alcohol use (measured by AUDIT-C), binge drinking (consuming five or more drinks on one occasion at least once a month), and other unhealthy lifestyles as primary outcomes. Results were analyzed by linear mixed model and mixed-effects logistic regression with the aim to test the efficacy of WBI in comparison with LI and NI. AUDIT-C total score increased more in NI in comparison with WBI (p=0.008) and LI (p=0.003) at 6-month. The odds to be classified as at-risk drinker was lower in WBI (OR 0.01; 95%CI 0.01–0.14) and LI (OR 0.01; 95%CI 0.01–0.03) than NI at 6-month. The odds to use e-cigarettes at 6-month (OR 0.01; 95%CI 0.01–0.35) and cannabis at post-test (OR 0.01; 95%CI

0.01–0.18) were less in WBI than NI. Sleep hours at night decreased more in NI than in WBI (p = 0.029) and LI (p = 0.006) at 6-month. Internet addiction scores decreased more in WBI (p = 0.003) and LI (p = 0.004) at post-test in comparison with NI. Conclusions about the obtained results, limitations of the study, and future implications are discussed.

In the seventh chapter, the data of the project collected during the pandemic are presented and compared with those from recent literature.

Keywords: adolescence, alcohol, binge drinking, lifestyle, psychological well-being

Abbreviations: WBI (Well-Being Intervention); LI (Lifestyle Intervention); NI (No Intervention)

“Excellence is never an accident. It is always the result of high intention, sincere effort, and intelligent execution; it represents the wise choice of many alternatives - choice, not chance, determines your destiny.”

— Aristotle

FIRST PART. INTRODUCTION

CHAPTER 1: ADOLESCENCE, LIFESTYLE AND RISKY BEHAVIORS

Adolescence

Adolescence is a specific period of development that is usually reported to start with puberty, but it is not always easy to define the precise age range (Palmonari, 2011; Wexler Rainisch & Upchurch, 2013). Indeed, different terms are used to refer to more specific stages, characterized by different changes, goals, psychosocial and physical characteristics (e.g., preadolescence, late adolescence, emerging adulthood). Preadolescence is a stage of development that encompasses 'children' from ages 6-7 years-old through 11-12 years-old; a period from ages 12-14 is considered preadolescence for some authors and adolescence or early adolescence for others (Curtis, 2015; Gunn & Smith, 2010; Shokouhi et al., 2014). Middle adolescence is the period between early and late adolescence and encompasses the age from 14-15 to 16-19 (Curtis, 2015). Emerging adulthood or late adolescence is from 18-19 years-old to adulthood (approximately 29 years old), characterizing a transitional period between adolescence and adulthood (Curtis, 2015; Palmonari, 2011). Whereas the ranges presented above are not absolute and rigid, it is necessary to understand how they are defined in the different studies in order to better understand the external validity of different research and the implications of their results in everyday reality.

Adolescence is a period of change and development that affects several aspects such as biological, cognitive, behavioral, psychological, and social. One of the most significant changes which marks the entry into adolescence (i.e., puberty) is characterized by sexual maturation and the achievement of full adult reproductive capacity (Benner & Wang, 2015; Ellis et al., 2012; Palmonari, 2011; Schacter et al., 2016). Sexual maturity is associated to some bodily changes that involve both primary and secondary sex characteristics (Schacter et al., 2016). They are caused by augmented production of specific hormones (testosterone in males and oestrogen in females) (Schacter et al., 2016). Primary

sex characteristics involve the human structures that play a direct role in reproduction (Schacter et al., 2016). Secondary sex characteristics are related to dramatically body changes connected with sexual maturity but not immediately involved with reproduction (Schacter et al., 2016). For instance, girls experience the onset of menstruation and boys the emergence of the capacity for ejaculation as part of primary sex characteristics (Schacter et al., 2016). Instead, the lowering of the voice, the appearance of pubic hair, facial hair, underarm hair are examples of changes in secondary sex characteristics (Schacter et al., 2016). Physical growth (e.g., height) and changes in metabolism also occur during adolescence (Benner & Wang, 2015; Ellis et al., 2012; Palmonari, 2011; Schacter et al., 2016). Growth in adolescence is usually rapid (Schacter et al., 2016). In fact, the average teenager accumulates about 18 kg and grows about 25 cm in just three or four years (Schacter et al., 2016). Girls begin to mature earlier than boys (Schacter et al., 2016). Around age ten, girls' growth rates begin to accelerate, and they reach their full height around age 15-16 (Schacter et al., 2016). Boys have a similar growth surge about two years later, reaching full height around age 17-18 (Schacter et al., 2016). The brain, like the body, undergoes changes during adolescence (Blakemore, 2012; Schacter et al., 2016). Just before puberty, for example, the rate of growth of tissue linking different parts of the brain increases dramatically (Thompson et al., 2000). The connections between the parietal lobe (the brain region specialized for understanding spatial relations) and the temporal lobe (the brain region specialized for language) increase rapidly between the ages of 6 and 13, and then stop (Schacter et al., 2016). However, the prefrontal cortex undergoes the most fascinating alterations during adolescence (Schacter et al., 2016). Indeed, the prefrontal cortex experiences a wave of synaptic proliferation just before puberty, followed by a cycle of synaptic pruning during adolescence (Giedd et al., 1999).

The massive, often abrupt, changes that occur during this developmental stage often lead adolescents to ask questions about their identity (Palmonari, 2011). They try to figure out who they are, usually by gradually distancing themselves from their parents and seeking greater psychological and emotional closeness with their peers (Palmonari, 2011). Before puberty, the child relies on parental

beliefs and ideas to look at himself and the world (Schacter et al., 2016). But during adolescence, peers become more important reference points for understanding the new needs that emerge at this stage of development (Schacter et al., 2016). Indeed, the interactions between parents and their children may become briefer, less frequent and sometimes more confrontational and aggressive (Larson & Richards, 1991; Schacter et al., 2016). Sometimes fights are caused by unimportant topics such as clothes; in fact, adolescents tend to dispute more with their mothers than with their fathers (Caspi et al., 1993; Schacter et al., 2016). In some cultures, such as those where duty is emphasized, conflict between parents and their children is almost absent (Greenfield et al., 2003; Schacter et al., 2016). Adolescents form relationships with peers in a similar way across cultures and historical eras (Dunphy, 1963; Weisfeld, 1999). In early adolescence, youth begin to form friendship groups with those of the same gender, who are often also childhood friends (Brown et al., 1994). At a later stage, groups of males and females begin to interact in public places such as malls or town squares. As they get older, adolescents in these all-male or all-female groups tend to create smaller mixed (male and female) groups. Finally, some of them break away from the group to begin romantic relationships.

Finding one's identity is defined one of the most important tasks, a crisis, of adolescence (Erikson, 1959; 1994). James E. Marcia (1980) delving deeper into identity theory by identifying four states of identity: identity achievement; identity diffusion; foreclosure; moratorium. They are the combination of commitment (the extent of personal investment) and crisis (the presence or absence of a decision-making period) in occupation and ideology areas (Marcia, 1980). Identity achievements are characterized by researching and sifting through several options until individual decide to commit to one of them (Marcia, 1980). Identity diffusions are those who lack a clear occupational or ideological direction, whether or not they have gone through a crisis (Marcia, 1980). Foreclosures tend to commit to ideological and occupational positions, but these were chosen by parents rather than self-chosen (Marcia, 1980). Moratoriums are living an identity crisis for ideological and/or professional issues (Marcia, 1980). Marcia’s theory (1980) is more explanatory than Erikson's two-factor theory (identity vs. identity confusion) (1959; 1994). In addition, identity states have both negative and positive

aspects. For instance, people in Identity accomplishment status are often regarded as powerful, self-directed, and adaptable, but there is a risk of premature identity formation, which can limit one's final adaptability by committing to vocational and ideological commitments too early (Marcia, 1980). Because of the complexities of today's society, the search for one's identity for teenagers can be more complicated than in the past (Nolen-Hoeksema et al., 2017). They have nearly limitless options in terms of professions, values, and behaviors (Nolen-Hoeksema et al., 2017). Another factor that can complicate this process is that adolescents, unlike children, can choose which groups they want to be a part of (Schacter et al., 2016). They cannot choose their family, but they can choose their peers based on their shared values, beliefs, attitudes, and perspectives (Schacter et al., 2016). Another issue that can arise is when parents do not accept their children's autonomy (Schacter et al., 2016). Many conflicts between parents and children, for example, involve behaviors that limit their autonomy, such as their evening return time (Holmbeck & O'Donnell, 1991; Schacter et al., 2016). Finding one's own identity is made easier if adolescent's social circles (parents, teachers, peers) express values and ideas that are consistent with one another (Nolen-Hoeksema et al., 2017). Ideally, the identity crisis should be resolved around the age of twenty so that the individual can focus on other responsibilities in life (Nolen-Hoeksema et al., 2017). When the process is completed successfully, the individual has developed an identity, which is a coherent sense of their sexual identity, occupational preferences, and ideological worldview (Nolen-Hoeksema et al., 2017). Indeed, adolescence is not necessarily a period of storm and stress, but it is dense with challenges and changes, as well as different and new images of themself projected by significant others and society (sometimes an adolescence is considered as an adult with specific responsibilities, other times a child who cannot make important decisions on his own) (Palmonari, 2011). An additional challenge could come from adolescent's immigration status. Many ethnic minority youth struggles with their identity, and conflict resolution can take many forms (Nolen-Hoeksema et al., 2017; Phinney & Alipuria, 1990; Sellers et al., 1998). Some live within the predominant culture while feeling outsiders (Phinney & Alipuria, 1990; Sellers et al., 1998). Others assimilate the predominant culture while rejecting their own or reject the

predominant culture and focus only on their own (Phinney & Alipuria, 1990; Sellers et al., 1998). Finally, some adolescents manage to find a balance between the predominant culture and their own (Phinney & Alipuria, 1990; Sellers et al., 1998).

Moreover, several studies have shown that being an immigrant increases the risk of psychological health problems, risky behaviors, and being bullied (Barsties et al., 2017; Stevens et al., 2015; Stevens et al., 2020; Walsh et al., 2016).

Teenagers, whether immigrant or not, can become very confused and inconsistent as a result of the doubts and questions that pervade their minds (Palmonari, 2011). In fact, moods and emotions are often changeable: adolescents feel happy and elated, but also confused, bored and with feelings of emptiness, sad and depressed, anxious, tense, and stressed (Gunn & Smith, 2010; Palmonari, 2011; Pharo et al., 2011). Furthermore, the emotions felt are more intense also because of the cerebral changes that characterize this phase of development. When adolescents are angry and in the grip of strong emotions, it is more difficult for them than for adults to control their emotions and allow rationality to prevail (Palmonari, 2011). In fact, more than in childhood and adulthood, this period is characterized by impulsivity, which frequently leads to dangerous actions for their own and others' psychophysical health (Gunn & Smith, 2010; Pharo et al., 2011). Increased impulsivity, a desire to try new things, to break adult rules, and to conform to peers can result in more risky behaviors such as legal and illegal substance use, unprotected sexual activity, self-harm, and suicidal behavior, than in other age groups (Dahl, 2001; Marshall, 2014; Layne et al., 2014). These behaviors can also be associated with each other making the situation worse. For example, substance use is associated with approximately 25-50% of suicides and is particularly associated with suicides in adolescence (Conwell et al., 1996; Woods et al., 1997). Even if adolescents who engage in these behaviors are aware of the risks (e.g., through prevention campaigns; educational meetings in school and extracurricular settings; explanations provided by parents), they ignored them and emphasize the sense of gratification and reward involved, especially when in the presence of peers (Lin, 2016). The reward centers of the brain are more sensitive making it more likely that adolescents go in search of

strong emotions by enacting risky behaviors (Galván, 2013). A large portion of these reinforcers is experienced with friends rather than family, which may explain why adolescents prefer to spend time with peers and behave differently when with them (Schacter et al., 2016). In line with this, a study showed that adolescents behaved more riskily in the presence of others (Gardner & Steinberg, 2005). In Gardner and Steinberg's (2005) study, three samples of different ages (14-year-olds, 19-year-olds, and adults) were observed during a driving game under two different conditions: in one they were alone, and in another they were with their peers. No differences emerged between the groups when they performed the test alone. In contrast, when they were in a group, 14-year-olds exhibited riskier behaviors such as increased speed and more crashes. Nineteen-year-olds also showed a 50% increase in risky behaviors when tested in groups. In contrast, the adult sample showed no differences when tested alone or in groups. Indeed, an important reward in adolescence is peer acceptance, which is positively associated with self-esteem and social competence (Marshall, 2014). On the other hand, adolescents who are not accepted by their peers tend to be depressed, lonely and withdrawn (Pope & Bierman, 1999). Peer acceptance can change from early to late adolescence showing more tolerance and openness towards others (Kinney, 1993). Peer group gains significant importance by also being able to influence adolescent's decisions and behaviors (DeLay et al., 2016; Lin, 2016; Palmonari, 2011). Furthermore, adolescents with a present-centered temporal orientation are more likely to engage in health-harming behaviors (e.g., smoking and drinking) because they value immediate gratification over long-term consequences (Palmonari, 2011; Zambianchi et al., 2010). In other cases, the desire to experiment and explore, creativity, and impulsivity flow into adaptive and constructive behaviors and activities (Smith et al., 2012). The most important predictors of adaptive or maladaptive behaviors in adolescents are family, peer group, and school context (Layne et al., 2014).

Family has an important role in children’s adjustment during adolescence, in particular, in helping them to build their own identity and to achieve independence (Palmonari, 2011). Adolescents feel the need to distance themselves from their parents in order to achieve these goals, and they seek a new reference group, which is the peer group (Palmonari, 2011). Despite this, parents continue to play a

fundamental role; in fact, emotional support, observation and control of what children do have an influence on their behavior (in the presence of rules and concern the child feels safer and loved and less inclined to transgress) (Fiz Pérez & Ciancio, 2012; Kuntsche et al., 2004). Greater observation and control result in better knowledge of adolescent children by their parents (knowing their experiences, activities, and group of friends), which is associated with less involvement in risky behaviors and greater adolescent pisco-physical well-being (Lippold et al., 2016). Parenting style is another variable that characterizes the parent-child relationship that has been extensively considered in the literature (Laghi et al., 2012b; Palmonari, 2011; Smorti & Guarnieri, 2015). Several studies have highlighted that the parenting style can lead to a more or less adaptive development of children (Palmonari, 2011). Indeed, it can be a protective factor that leads to a good adolescent' s adaptation when it is characterized by a good balance between parents' control and respect for their children's behavior, well-defined and consistent rules, involvement in their lives, reward for positive behaviors, congruent and predictable parental behaviors (Laghi et al., 2012a; Smorti & Guarnieri, 2015). It can also be a risk factor for internalizing and externalizing problems when there is neither involvement nor control of children and punishments are rigid and unreasonable (Laghi et al., 2012a; Smorti & Guarnieri, 2015). Moreover, the literature shows that an authoritative parenting style, characterized by high levels of demandingness (degree of maturity and responsibility that the parent expects from their child) and responsiveness (amount of supportive response of the parent to the child's needs) leads to the best adaptation outcomes: higher levels of self-esteem, greater psychosocial competence, more creativity and curiosity, better school performance and skills in social relationships (Palmonari, 2011). In contrast, children of parents with permissive or authoritarian parenting styles have low levels of self-esteem, probably because they feel, respectively, abandoned to themselves or overly controlled and pressured (Palmonari, 2011; Stolle et al., 2009). Another risk factor for adolescents' health and well-being concerns parental unemployment that involved almost 5% of adolescents (Frasquilho et al., 2016; Inchley et al., 2020; Johansson et al., 2019; Pförtner et al., 2015). Family can play either positive (Fiz Pérez & Ciancio, 2012; Kuntsche et al., 2004; Lippold et al., 2016; Palmonari,

2011) or negative (Han et al., 2010; Laghi et al., 2012b; Layne et al., 2014; Palmonari, 2011; Smorti & Guarnieri, 2015) role on their children's growth and adjustment. Family may influence children's involvement in risky behaviors: the type of family context explains 5-7% of the variance in violent and suicidal behaviors; 6% of the variance in alcohol use; and 6-9% of marijuana use (Layne et al., 2014). Parental work also plays an important role in family well-being (Han et al., 2010). When parents work in evenings and at night, they are more tired during the day and report higher levels of stress than those who work during standard hours (6 a.m. - 6 p.m.); this greater discomfort leads them to spend little time with their children and leads to a more compromised family climate and less positive relationships to the point of increased risky behaviors in their children (Han et al., 2010). Another important characteristic within the family environment is the quality of communication, particularly the dialogue between parents and children (Palmonari, 2011). A family environment positively valued may allow for the exchange of ideas and lead to greater family cohesion (Palmonari, 2011). Mothers are usually described as more understanding than fathers, who are more judgmental (Palmonari, 2011). The ease/difficulty of adolescents in talking to their parents about issues of concern was investigated in the HBSC (Health Behaviour in School-aged Children) study. HBSC is a cross-national study sustained by the World Health Organization (WHO) that has investigated young people's health (e.g., social context, health, risk behaviors) for over 30 years across Europe and North America. It was found that the ease of talking to both father (76% for 11-year-olds, 64% for 13-year-olds, and 57% for 15-year-olds among girls; 84% for 11-year-olds, 80% for 13-year-olds, and 74% for 15-year-olds among boys) and mother (91% for 11-year-olds, 83% for 13-year-olds, and 79% for 15-year-olds among girls; 91% for 11-year-olds, 87% for 13-year-olds, and 82% for 15-year-olds among boys) decreases with age (HBSC, 2018). Boys communicate with their father more easily than females (HBSC, 2014; 2018). Compared to the data obtained from the 2014 HBSC study, the ease with which adolescents communicate with their parents has remained almost unchanged. The relationship with parents in the Italian context is no longer characterized by excessive transgression and exaggerated conflicts to obtain their freedom; adolescents of this decade have autonomy and

independence, they consider their parents as allies and conflicts often concern trivial situations of daily life (Pietropolli Charmet, 2008; Palmonari, 2011). Moreover, Italian adolescents do not contribute much to household chores and have a lot of free time, about four hours a day, which they spend watching TV, listening to music, on the computer (social networks, chatting, movies, TV series, etc.) and texting their friends (Palmonari, 2011).

From middle childhood and early adolescence, relationships with peers become increasingly important (Somerville, 2013). These interactions become one of the most important aspects in forming and controlling the psychological development of young individuals (Barnes et al., 2007). Indeed, when these relationships are considered supportive, they may have a positive impact on academic outcomes (Schwartz et al., 2008; Vandell & Hembree, 1994), identity (Meeus et al., 2002), and social competence (Liable, 2007). On the other hand, adolescents who lack supportive peer relationships show a negative development characterized, for example, by risk-taking behaviors (e.g., drinking, smoking, sexual relationships) (Kippig et al., 2012), and negative consequences on mental health later in life (Lereya et al., 2015).

Peers are in the same stage of development and often face the same problems and changes, which is why relationships during adolescence become intense and very meaningful. Adolescents take their peers as benchmarks about behaviors and emotions (Palmonari, 2011). They observe how others face problems and challenges in a constant attitude of continual comparison between themselves and others (Palmonari, 2011). Be part of a group is also important in building a reputation within the social context (Palmonari, 2011). Italians stated that many of their friendships were born at school, particularly during high school (Palmonari, 2011). Establishing strong bonds with peers, and friendships can act as a protective factor in the adolescents' adaptation. In fact, gaining acceptance from peer group acts as a social reward, increases self-esteem and social competence (Marshall, 2014). On the other hand, peers can also play a negative influence as evidenced by the finding that having friends who drink alcohol predicts more alcohol use (DeLay et al., 2016; Lin, 2016). When harmful behaviors are enacted by peers, they take on a normal valence and are practiced more

frequently (DeLay et al., 2016; Marshall, 2014; Lin, 2016). In addition, adolescents also tend to overestimate how much peer group enacts certain behaviors: adolescents who drink alcohol tend to overestimate the number of friends who drink alcohol and the frequency of their drinking (Chiauzzi et al., 2013; Haug et al., 2017; Laghi et al., 2012a). When adolescents are with peers, they tend to exhibit greater risky behaviors than when they are alone, a trend not seen among adults (Smith et al., 2014), indicating that adolescents are more likely to engage in risky behaviors when they are in a group. Not only is the influence on risky behaviors present when adolescents are with friends or peers they do not know, but also when they believe they are being watched by peers (Smith et al., 2014). Furthermore, in the presence of peers, adolescents tend to engage in risky behaviors even when they know the pros and cons of a particular action: they engage in behaviors that allow for immediate reward even though it may have negative consequences (Smith et al., 2014). Not all adolescents are influenced by group of peers in the same way. Indeed, those who perceive they have control over themselves, and their lives were less likely to be influenced by others and enact risky behaviors (Lin, 2016). In addition, adolescents, more than in other stages of life, overestimates the attention that others place on their physical appearance and behavior (Lin, 2016). This feeling of being constantly observed and judged leads adolescents to believe that their experiences are special; they can feel unique, invincible, and not vulnerable to the negative consequences of their actions (Lin, 2016). Despite knowing the risks of certain behaviors (unprotected sex, smoking, alcohol use, drugs) adolescents can think that nothing negative will ever happen to them (Fiz Pérez & Ciancio, 2012; Lin, 2016). However, when they suffer the negative consequences of their actions, they are less likely to seek social support because they believe others would not understand (Lin, 2016). This lack of help (because not sought) increases the frequency of substance use, as a coping strategy to deal with a situation for which one does not have the necessary skills and competencies (Lin, 2016).

The importance of relationships in human development has been widely studied over the years. From Bolwby's (1969) attachment theory on relationships with caregivers to interpersonal theories with a focus on relationships with significant others (peers) (Sullivan, 2013). A complementary effect of

both relationships can lead to the onset of affective disorders, according to the cumulative interpersonal risk model (Epkins & Heckler, 2011), but also to a protective effect, according to resilience theory (Zimmermann, 2013). Indeed, peers can act as a buffer when family relationships are deficient, and vice versa.

School is not just an organization, but a learning community in which people work together every day and influence each other, learn and contribute, have rights and duties towards each other, bring into play their limits and values and their emotions (Zani, 2012). School can be considered as a community with a psychological membership, defined as "the extent to which students feel personally accepted, respected, included, and supported by others in the school social environment." by Goodenow (1993, p.80). As a significant construct in students' life, psychological membership may predict a positive attitude towards school (Zani, 2012). The 2018 HBSC (Health Behaviour in School-aged Children) survey measured students' satisfaction with school and found that it tends to worsen with age: 39% of 11-year-olds were very happy with school versus 25% and 21% of 13-year-olds and 15-year-olds students, respectively (Inchley et al., 2020). Instead, the percentages of students who like school were lower among Italians, ranging from 19% of 11-year-olds to 9% of 15-year-olds (HBSC, 2018). Feelings and attitudes towards school play an important role on several variables in the adolescent's life. Indeed, according to previous research, students who enjoyed school had higher overall life satisfaction, were less likely to use substances, and had better mental health (McCarty et al., 2012; Guo et al., 2014; Joyce & Early, 2014; Vogel et al., 2015). Moreover, the lack of school sense of community is correlated with anxious and depressive feelings, loneliness, risky behaviors, victimization, and substance abuse (Zani, 2012). On the contrary, students who have a strong sense of school community attend school more willingly, get along well with their peers, perform better in school, and participate in school and extracurricular activities more frequently (Zani, 2012). Therefore, school, as well as family and peer group, can play a positive or negative role on the adolescent's overall adaptation. Indeed, school requires adolescents to overcome developmental tasks related to training and education, as well to building relationships (both with peers and adults) and

learning to adapt to life changes (Palmonari, 2011). In recent years, school also has some responsibility for the social adjustment of students, partly replacing the task of parents (Palmonari, 2011). Acquiring social skills in school can play a protective role by allowing students to use those skills outside of school and increasing their self-efficacy (Palmonari, 2011). The school setting also holds some importance on the risky behaviors enacted by the adolescent; in fact, it explains 6-7% of the variance in violent behaviors, 4-5% of alcohol use, and 5-6% of marijuana use (Layne et al. 2014). Feelings of belonging and liking towards school also depend on relationships with teachers, investigated in the 2018 HBSC survey as teacher support. As age increased, students' perceived support decreased: from 72% of 11-year-old to 44% of 15-year-old students who perceive support. In most countries, the school experience tended to worsen with age; in particular, school satisfaction and perceived support from teachers declined, while schoolwork pressure increased (HBSC, 2018). Schools may be appropriate settings to implement preventive interventions for students' health and well-being. On the basis of the 2014 HBSC data, the design and implementation of programs with the aim to promote health in young adolescents were present in almost all schools but not on an ongoing, consistent basis. Moreover, 4.6% of schools do not implement any preventive measure with regard to substance abuse and 2.4% with regard to violence and bullying, nor do they adopt measures to promote healthy eating (3.5%). Additionally, previous research emphasized the importance of carrying out preventive interventions within the school environment to reach a considerable number of subjects, reduce the stigma associated with mental health services (when mental health professionals are involved), increase the accessibility to early and effective interventions and improve social and emotional climate (Strøm et al., 2014; Tomba et al., 2010).

Risky behaviors and unhealthy lifestyle in youth

Adolescence is a period of transition from childhood to adulthood in which there are several factors that make the adolescent vulnerable and more prone to engage in risky behaviors (e.g., substance use,

binge drinking, reckless driving, unprotected sex, extreme sports). Adolescents do not yet find their own identities; want to prove themself and become autonomous but sometimes adults treat them as children; place a lot of importance on peer group by being influenced by their behaviors and ideas; their physical and mental changes make them insecure; the prefrontal cortex is not yet well developed and there is a greater sensitivity to environmental inputs due to the brain reorganization that occurs at this stage of development (Dodge & Albert, 2012; Ellis et al., 2012; Gunn & Smith, 2010; Fischer et al., 2011; Palmonari, 2011; Smith et al., 2012). Humans have the longest time of childhood and brain development compared to other mammals (Schacter et al., 2016). Research suggests that the brain continues to mature up to the age of 20-25 years old, making adolescents more vulnerable both to behave in a risky way and to the effects of substance use (Bourque et al., 2016; Burnett & Blakemore, 2009; Kuntsche et al., 2017; Xiao et al., 2013). Some behaviors are defined as risky because they may harm the one enacting them, those around them, and/or society and occur predominantly among adolescents rather than other age groups (Ellis et al., 2012). At this age, it is also more likely that unhealthy lifestyle tends to grow (Doumas et al., 2015), increasing the possibility of negative biopsychosocial consequences. Lifestyle factors are the major causes of chronic degenerative diseases, such as cardiovascular disease, diabetes, obesity (Kimiecik, 2011). They explain a rate from 50% to 70% of contemporary diseases (McGinnis & Foege, 1993). For instance, nine lifestyle-related factors (i.e., eating fruits and vegetables, obesity, blood lipids, regular exercise, smoking, alcohol consumption, blood pressure, diabetes, depression and stress) were responsible for 90% of heart attacks in the world (Yusuf et al., 2004). To know that behaviors as healthy diet and doing sports is beneficial for health does not always bring people to act in line with this conception (Catlin et al., 2003). Moreover, in a sample of women from three distinct age groups, lack of physical activity and smoking were the most closely connected to depression (Lee, 1999). Smokers had also lower average levels of enjoyment and life satisfaction than non-smokers, according to a study from the Penninsula College of Medicine and Dentistry (2008).

Given the importance of monitoring health and lifestyles during this vulnerable stage of life, several surveys have been conducted at the international level for several years. Two important examples are the HBSC and ESPAD (European School Survey Project on Alcohol and Other Drugs). ESPAD is one of the largest projects on adolescent substance use in the world. HBSC collects data from 11-, 13-, and 15-year-olds. ESPAD targets adolescents between the ages of 15 and 16. The latest available data are for 2018 (HBSC) and 2019 (ESPAD). The latest HBSC survey involved 227.441 adolescents from 45 countries/regions (Albania, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Canada, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Greenland, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, England, Scotland, Wales, Ukraine). The latest ESPAD survey involved 99.647 students from 35 countries (Austria, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, the Faroes, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Lithuania, Malta, Monaco, Montenegro, the Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Ukraine). It is very prominent to have up-to-date data, given the accelerating changes in the world (e.g., globalization, climate change, technological advances, pandemics) in order to suggest priorities for policy attention.

Comparison with surveys from previous years showed that substance use is decreasing and eating habits are improving (Inchley et al., 2020). Despite these generally positive figures, there are still goals to be met. For instance, the most important meal of the day (breakfast) is skipped by approximately 40% of adolescents (Inchley et al., 2020). This worsened in about half of the sample when compared to 2014 HBSC data. Girls tend to skip breakfast more than boys (Inchley et al., 2020). Although fruit and vegetable consumption has increased since 2014, the percentage of those who do not eat fruits and vegetables every day remains high (48%) (Inchley et al., 2020). Inadequate consumption of fruits and vegetables can result in micronutrient deficiency, which can increase the

risk of noncommunicable diseases such as cancer, cardiovascular disease, obesity and diabetes. In addition, as teens get older, they tend to consume more unhealthy foods (e.g., sweets) and skip meals (Inchley et al., 2020). Differences also emerge based on family wealth: adolescents from more affluent families have healthier diets (Inchley et al., 2020).

Physical activity practice also differs by socioeconomic status showing that adolescents from poorer families engage in less physical activity (Inchley et al., 2020). Overall, less than 20% of adolescents engage in physical activity consistent with WHO recommendations (60 minutes of moderate-to-vigorous physical activity daily) (Inchley et al., 2020). Since 2014, the trend has been downward (Inchley et al., 2020). The least active are older adolescents and girls (Inchley et al., 2020). Moreover, differences between countries/regions have emerged with the lowest percentages of activity in central/southern European ones (i.e., Italy, France, Portugal) (Inchley et al., 2020).

Another important behavior to consider at this age concerns internet use. Intensive use of online communication concerned 35% of the sample with the lowest percentage in Azerbaijan (12% of 11-year-old boys) and the highest in Italy (63% of 15-year-old girls) (Inchley et al., 2020). In particular, the development and spread of social media lead to problematic behaviors that erode adolescents' relationships and activities (Inchley et al., 2020). Based on the Social Media Disorder Scale (Van den Eijnden et al., 2016), 7% of the study population had problems with social media use, that include symptoms like loss of control on the use of it (Inchley et al., 2020). Moreover, 14% of adolescents prefer online communication than face-to-face interaction (Inchley et al., 2020). Previous study showed that people who tend to use online communication instead of face-to-face were lonely and depressed and that this type of interaction led to negative Internet use outcomes (e.g., mood alteration, compulsivity) (Caplan, 2003). Girls are at greater risk of developing issues related to social media use than their peers (Inchley et al., 2020).

The latest HBSC survey (2018) also showed that sexual behavior has remained problematic over the years (Inchley et al., 2020). In fact, about 25% of 15-year-olds do not use condoms or birth control pills. In addition, condom use has declined since the previous survey (Inchley et al., 2020).

Substance use is more common among boys, but the differences narrow around age 15 (Inchley et al., 2020). Indeed, in an Italian study that involved adolescents aged 15-21 (median age: 16±0.75), no gender differences were found in the enactment of risky behaviors (unprotected sexual activity, use of alcohol, tobacco and other drugs), except for reckless driving, which was more common among males than females (Zambianchi et al. 2010). In line with these findings, a general trend that has emerged in recent years concerns the decrease in alcohol use among male adolescents and the increase among female adolescents, increasingly reducing the gender gap (Goings et al., 2019; Johnston et al., 2016; Kraus et al., 2018). Although alcohol and cigarette use have shown a decrease from past years, they still represent a problem during a period of high vulnerability such as adolescence, and they increasingly involve the females (Goings et al., 2019; Inchley et al., 2020; Johnston et al., 2016; Kraus et al., 2018). The most commonly used substance is alcohol, which was consumed at least once by 59% of 15-year-olds, compared to cigarette use (28%) and cannabis use (13%) (Inchley et al., 2020). The use of alcohol, tobacco and cannabis in the last 30 days was 37%, 15%, 7%, respectively (Inchley et al., 2020). Alcohol use increased between ages 11 and 15 for both lifetime consumption (from 10% to 59% for girls and from 19% to 60% for boys) and current alcohol use from 3% to 36% for girls and from 7% to 38% for boys) (Inchley et al., 2020). HBSC survey found that adolescents who had been drunk twice or more were 20% in their lifetime and 15% in the last 30 days (Inchley et al., 2020). Drunkenness was more common among boys than girls (Inchley et al., 2020). In all countries/regions, the prevalence of recent and lifetime intoxication rose sharply with age in both genders, with the highest values in Denmark (Inchley et al., 2020). Only alcohol showed a positive association with family affluence, which is most likely due to its increased affordability and accessibility (Inchley et al., 2020).

Overall, prevalence of tobacco use showed no gender differences, but it differed widely between countries/regions with the lowest percentage of current smokers in Netherlands and Sweden (0.2% of 11-year-old girls) and the highest in Bulgaria (38% of 15-year-old girls) (Inchley et al., 2020). Italy was among the countries with the highest levels of lifetime and current smoking (Inchley et al., 2020).

Cigarettes use, as alcohol, increased dramatically with increasing age (Inchley et al., 2020). Italy had the highest age-related increase in current smoking among girls (32%) (Inchley et al., 2020).

Regarding cannabis use, it was more prevalent among boys than girls (Inchley et al., 2020). The lowest levels of lifetime and current cannabis use (< 4% and < 2 %, respectively) were registered in Azerbaijan and Kazakhstan, whereas the highest levels (24% and 18%, respectively) in Bulgaria (Inchley et al., 2020).

In addition, those who engage in one risky behavior are more likely to engage in others (Zambianchi et al. 2010). White and colleagues (2015) found that 46% of a group of New Zealand adolescents admitted to using at least two substances including tobacco, marijuana, and alcohol. Involving or not in risky behaviors has a multifactorial causality that includes the social sphere of adolescents (family and peer group), the environmental context in which they live (neighborhood, school, city) and their psychological and physical characteristics. It has been noted that these behaviors appear more frequently when the surrounding environment is unfavorable, characterized by few resources and conflicting relationships (e.g., conflict with parents; poverty; discrimination; attending delinquent peer groups; lacking attachment to one's community, teachers, and school) and less frequently when the environment is more favorable (Ellis et al., 2012; Han et al., 2010). For example, it has been found that good parent-child bonding, parental involvement in their lives, good communication, and support provided are protective factors against different behaviors such as smoking, using alcohol or other substances, being involved in delinquent behaviors, and starting sexual activity early (Han et al., 2010). Parental work activity also has an impact on risky behaviors that are more prevalent in those families in which parents work at night (Han et al., 2010). Negative characteristics within the family environment (impaired parental understanding, lower levels of trust and happiness in the home, dysfunctional communication) increase adolescent involvement in risky behaviors (drunkenness, tobacco, cannabis, other drug use), but the school environment (sense of safety, belonging, atmosphere, relationships with teachers, fairness of rules) takes a protective value in this association (Freeman et al., 2010). Multiple children may be present in a family, and it has been found that sibling

relationships play an important role and can be characterized as both a protective and risk factor (Solmeyer et al., 2014). A warm and supportive relationship with a brother and/or sister protects against involvement in delinquent activities and allows, especially for the younger brother and/or sister, to acquire a positive role model by which to interact with people outside their family (Solmeyer et al., 2014). Conversely, a hostile, negative, uncaring sibling relationship increases the likelihood of engaging in criminal actions and exhibiting behavioral problems (Solmeyer et al., 2014). In the case where the sibling relationship is intimate but oriented toward dangerous and illegal actions, it is more likely that the two siblings will encourage each other to enact delinquent actions, smoke cigarettes, and drink alcohol (Solmeyer et al., 2014).

On one hand, the present-centered temporal perspective is one of the factors explaining adolescents' involvement in health-risk behaviors (especially when the consequences are not immediate): more importance is given to gratification and goals that can be achieved immediately, without worrying about future consequences (Zambianchi et al., 2010). On the other hand, the ability to plan one's activities is negatively correlated with involvement in risky behaviors (use of alcohol, cigarettes, drugs, reckless driving) and positively correlated with future-centered temporal perspective. Adolescents with greater planning skills will be more likely not to engage in dangerous behaviors because they place great importance on their future and therefore take into account the consequences of their own actions (Zambianchi et al., 2010). A previous study showed that not only specific personality traits (sensation seeking, aggression, impulsivity, sociability), but also poor performance on neuropsychological tests that require prefrontal cortex activation (which is not fully developed at this age) predicted greater involvement in risky behaviors in adolescence (Pharo et al., 2011). Both studies about brain lesions and neuroimaging showed that risky decision making partially depends on the prefrontal cortex (Schacter et al., 2016). Indeed, substance-dependent people, like cocaine addicts and alcoholics, performed poorly on the gambling task in a similar way to people with prefrontal cortex damage (Bechara et al., 2001; Johnson et al., 2008). Specifically, a sample of adolescent binge drinkers performed worse than non-drinking peers on the Iowa Gambling Test showing a tendency

to disregard future consequences of actions because the immediate reward is more important (Johnson et al., 2008). This difference was not found between non-drinkers and drinkers who did not practice binge drinking (Johnson et al., 2008).

Risky behaviors can have a variety of consequences in the short (e.g., death or injury after a car accident due to reckless driving) and long term (e.g., substance dependence) that partially explain increased morbidity and mortality in adolescence (2/3 times greater than in childhood) (Dahl, 2001; Pharo et al., 2011). The leading cause of death among 10- to 24-year-olds is due to fatal traffic crashes that are usually caused by risky behaviors (e.g., alcohol and drug use, speeding, illegal racing, not wearing a seatbelt) while riding motorcycles or cars (Fischer et al., 2011). About 5000 American teens who are under 21 die each year from alcohol abuse and risky behaviors on the road (Fischer et al., 2011). Almost half (48%) of sexually transmitted diseases affect teens aged 15 to 24 because of not using contraceptives during sexual intercourse (Fischer et al., 2011). Not only do at-risk behaviors frequently occur in comorbidities, but also the increase from early to late adolescence (ages 11 to 20) necessitates a special focus on very young adolescents who engage in risky behaviors (Solmeyer et al., 2014).

Substance use, which can be classified among risky behaviors, has increased over the years in younger age group (Fischer et al., 2011). In a sample of preadolescents between the ages of 9 and 13 (66.8% 11-year-olds), 10.2% consume alcohol and 35.4% of them have been drunk at least once in their lives (Gunn & Smith, 2010). In addition, 6% of the sample reported experiencing problems because of their drinking: 3.6% had experienced stomach pain or vomiting, 2.8% had had a hangover, 2.7% had said or done embarrassing things, 2.4% had gotten into trouble with their parents, and 2.3% had been unable to remember what they had done while drinking (Gunn & Smith, 2010). Drinking alcohol at an early age is a very concerning risky behavior and it is more likely to lead to the onset of alcohol-related problems, illegal substance use, and risky sexual behaviors (Conrod et al., 2008). The use of substances in itself leads to negative consequences on the psychophysical health of adolescents and those around them, but some types of substance intake are even more dangerous. An example is

pregaming (or prepartying) (Barnett et al., 2013). This is the habit of consuming alcoholic beverages before going to a social event where alcohol will still be consumed (Barnett et al., 2013). Another risky behavior that is emerging among adolescents consists of mixing alcohol and energy drinks: this mix of substances reduces the perception of alcohol intoxication because the exciting effect of energy drinks acts on the sedative effect of alcohol (Flotta et al., 2014). In a sample of Italian adolescents (15-17 years old), 46% said they had drunk this mix of substances (Flotta et al., 2014). Another mode of alcohol intake that is becoming more prevalent among adolescents is the consumption of 10, 15, or more alcoholic drinks on a single occasion, which is called extreme binge drinking (Patrick & Schulenberg, 2014). The greater presence of risky behaviors in this age group than in others, as well as new emerging fads, could be attributed to the media's increased glorification of these behaviors (Dahl, 2001). Indeed, a meta-analysis by Fischer and colleagues (2011) demonstrated causality between exposure to risk-enhancing media content (such as certain television programs in which dangerous challenges take place) and increased risk-oriented intentions and behaviors. The effect is greater when exposure is active (e.g., video games) than passive (e.g., music, movies) (Fischer et al., 2011). These results are in line with Albert Bandura's social learning theory (1977). Exposure to alcohol-related content on social networking sites is also associated with higher levels of alcohol abuse, and the strongest association is with posting this type of contents (Geusens & Beullens, 2016). Therefore, adolescents who post this type of contents could be characterized as an at-risk population on which to intervene (Geusens & Beullens, 2016). A longitudinal study involving U.S. adolescents and young adults between the ages of 15 and 26 showed that exposure to alcohol advertisements (on TV, billboards, radio, magazines) increased alcohol consumption (Snyder et al., 2006). In European adolescents (Italians, Germans, Poles, Scots) with a mean age of 13.5 years, responsiveness to alcohol advertisements (measured as preference of a particular advertisement) was related to binge drinking and predicted who will become binge drinkers in a second measurement (about one year after the first) (Morgenstern et al., 2014). Exposure to advertisements and content of various types that relate to risky behaviors such as binge drinking had a significant impact on adolescents (Fischer et al., 2011;

Geusens & Beullens, 2016; Morgenstern et al., 2014; Snyder et al., 2006). Therefore, data from a research conducted by OSSFAD (Osservatorio Fumo Alcol e Droga or Observatory Smoking Alcohol and Drugs) showed worrying results: on television, every 13 minutes of program/ movie/ fiction there was an act-alcohol (act of active intake of one or more alcoholic beverages) and that the frequency increased (1 act-alcohol every 4 minutes) in periods when adolescents do not go to school and there is more likelihood that they watch TV (summer and Christmas vacations) (Faralli et al. 2003).

Another important variable in the implementation of a behavior is the motivation that drives individuals with respect to goals they want to achieve (Maslow, 1943), such as wanting to increase their power in social hierarchies (Ellis et al., 2012). Enacting certain behaviors (e.g., reckless driving, drug use, violent behavior) in adolescence, but not in adulthood, confers a certain status within the group, which is why they are often enacted in the presence of others (Ellis et al., 2012). Greater social status also equates to greater sexual attractiveness and, likely for this reason, males enact more risky behaviors than females (Ellis et al., 2012). Indeed, among young adolescents, females report less involvement in risky behaviors than their male peers; however, in middle and late adolescence the differences taper off (Solmeyer et al., 2014; Zambianchi et al., 2010). Behaviors such as bullying can also be considered adaptive for the adolescent as they confer status and allow for certain resources (Ellis et al., 2012). This theory by Ellis and colleagues (2012) about the adaptive function of risky behaviors is not fully accepted in line with the fact that some behaviors appear to not have positive functions on the individual's adaptation and growth (Dodge & Albert, 2012).

Prevalence of substance use among European and Italian adolescents

Europe is the continent with the highest level of alcohol consumption in the world (World Health Organization [WHO], 2018). ESPAD data are collected every 4 years in European countries and the last survey was conducted in 2019. It involved 35 European countries, including Italy, with a total of

99.647 students between the ages of 15 and 16 (ESPAD, 2019). Students were asked how easy it was to find cigarettes, alcohol, cannabis, and other drugs: the European average was 78% for alcohol, which was characterized as the most easily found substance; 60% for cigarettes; 32% for cannabis; and from 8% to 14% for other drugs (i.e., crack, methamphetamine, amphetamine, cocaine, ecstasy) (ESPAD,2019). Italy ranked above average for alcohol (83%), cigarettes (61%), and cannabis (37%), despite the prohibition for minors on the purchase of alcohol and cigarettes and the illegality of cannabis (ESPAD, 2019). Early substance use (first use at or before age 13) was also investigated: alcohol was the substance more frequently used at an early age than the other substances (33% of the sample reported drinking alcohol at or before age 13 versus 18%, 11%, 2% for cigarettes, e-cigarettes, and cannabis, respectively) (ESPAD, 2019). Italy had a slightly lower percentage than the European average (28%) (ESPAD, 2019). Compared to the previous survey (ESPAD, 2015), there has been a decline in alcohol use among adolescents who are 13 years of age or younger. Being drunk at age 13 or younger has been reported by 6.7% (range: 1.8% - 25%) of European students (with the lowest percentage in Iceland and the highest in Georgia) (ESPAD, 2019). Italians who report getting drunk early are 3.9% (less than the European average) (ESPAD, 2019). Alcohol is the most used substance among European 15-16 year old: 79% (with values exceeding 90% in Hungary, Denmark and Czechia) have drunk alcohol at least once in their lives (84% among Italians); 47% have drunk in the 30 days prior to the interview (the highest value was found in Denmark with 74%; instead in Italy the percentage was 59%); 13% have been intoxicated in the last 30 days (with the highest percentage among Danes, corresponding to 40%) (ESPAD, 2019). Italian adolescents who reported having been drunk were 12%, in line with the European percentage (ESPAD, 2019). The phenomenon of binge drinking (five or more drinks on one occasion; one drink contains approximately 2 centilitres of ethanol) at least once in the last 30 days was reported by 34% of European adolescents, with the highest values in Denmark (59%), Germany (54%) and, Austria (49%) and involved more males than females (ESPAD, 2019). Among Italians, binge drinking was reported by 35% (38% among males and 32% among females) (ESPAD, 2019). Alcoholic drinks preferred by adolescents were beer and

spirits (ESPAD, 2019; Graziano et al., 2012; Villa et al. 2016). Based on different culture, history and lifestyle, countries showed to have specific preference to a drink than another (Flensborg-Madsen et al., 2008; Room & Mäkelä, 2000). For instance, in Northern countries as Norway and Finland people like to drink spirits, whereas in countries of the center of Europe (e.g., Czechia) the most consumed alcoholic drink is beer and in Mediterranean countries, as Italy and France, wine is the most popular (Flensborg-Madsen et al., 2008; Room & Mäkelä, 2000). However, sometimes these trends are not respected when considering adolescents (Bräker & Soellner, 2016; Room & Mäkelä, 2000). Indeed, spirits are becoming increasingly popular, especially among girls (ESPAD, 2019). Moreover, the type of preferred alcoholic beverages was found to be associated with quantity of alcohol intake, frequency of heavy drinking and drinking motives (Callinan & MacLean, 2016; Dey et al., 2014). Situations characterized by heavy drinking usually involve beer and spirits than wine (Callinan & MacLean, 2016). Moreover, beer preference seems to be associated with illicit drug use and risky drinking patterns (Dey et al., 2014). However, those who had heavy drinking behaviors were more likely to use other substances and to be affected by negative alcohol-related consequences, regardless of the type of beverage chosen (Dey et al., 2014). A longitudinal analysis about the ESPAD data showed a downward trend of alcohol use in all European countries involved, except for Balkan countries, until 2015 (Kraus et al., 2018). However, from 2015 to 2019 there were no noticeable changes except for some countries (Hungary, Ireland, Romania, Slovakia, Ukraine) showing an increase of 5% or more and others (Austria, Bulgaria, Cyprus, Czechia, Lithuania, Malta) showing a decrease of 5% or more (Kraus et al., 2018). Binge drinking has also remained stable except for The Faroes, Germany and North Macedonia that have recorded an increase, and Austria, Bulgaria, Cyprus, Greece, Latvia, Lithuania and Malta that showed a decrease (Kraus et al., 2018).

Regarding cigarette smoking, over the previous ten years, the percentage of early initiation of daily cigarette smoking (at age 13 or younger) remained reasonably consistent at around 10%, with a significant decline to 3% by 2019 (ESPAD, 2019). The same trend was registered for lifetime cigarettes use (from 46% in 2015 to 41% in 2019) (ESPAD, 2019). A significant reduction in cigarette

use was observed in 18 European countries from 2015 and 2019 (ESPAD, 2019). Different results emerged for Italy, Montenegro and Romania whose data remained fairly unchanged (55%, 35%, 49%, respectively) (ESPAD, 2019). Daily cigarettes use also diminished from 2015 to 2019 in 15 European countries and remained almost stable in the others (ESPAD, 2019). Considering the cumulative percentage of all countries involved in ESPAD surveys, students who smoked daily in the prior month were 21% in 2015 and 10% in 2019 (ESPAD, 2015; 2019). Italy showed higher rate than the European one (19%) which however was decreasing compared to the previous survey (37%) (ESPAD, 2015; 2019). The downward trend in smoking may be attributed in part to legislative measures, such as restrictions on underage tobacco product purchases and tobacco advertising, which have been implemented in the majority of European nations (Shibuya et al., 2003; Van Hurck et al., 2019). However, nicotine intake has undergone changes in recent years. In fact, the advent of electronic cigarettes (e-cigarettes) has increased causing the decrease of regular cigarettes use (ESPAD, 2019). When lifetime use of cigarettes and e-cigarettes is considered, an increase from 2015 to 2019 in 20 European countries emerges (ESPAD, 2019). In contrast, only four countries (Iceland, Ireland, Lithuania and Norway) saw an increase in daily use (ESPAD, 2019). E-cigarettes allow to inhale vaporized substances that may contain nicotine or not and in different quantities (Clapp & Jaspers, 2017). Both for their variety and recent appearance, the results on their long-term consequences on health are indeed controversial (Bals et al., 2019; WHO, 2019b; 2020). Recent literature found that e-cigarettes sometimes contain detectable levels of heavy metals and carcinogens and high levels of nicotine, making them dangerous for health (Farsalinos & Polosa, 2014; Olmedo et al., 2018). Although e-cigarettes have entered the market to replace the use of regular cigarettes, this is not always the purpose. In fact, the ESPAD data (2019) showed that the majority of those who start using e-cigarettes, did not smoke before (23%), 14% were occasional smokers and only 4.2% were regular smokers. Among youth, former and never smokers seem to be very attracted by e-cigarettes, probably due to the supposed lessened harm associated with the usage of these products (Kong et al., 2017; Perikleous et al., 2018; WHO, 2019a; Yoong et al., 2018). In the United States, an upward trend in

e-cigarettes use among 10- to 24-year-olds has emerged over the past five years (Cullen et al., 2018). In fact, WHO recommendations recently focused on preventing the initiation of electronic nicotine inhalation system use by non-smokers and vulnerable people (WHO, 2020b). From the last ESPAD data (2019) emerged that 11% of students used e-cigarettes at 13 years-old or before and that 40% used them at least once in their lives. If considering only boys, the lifetime percentage (46%) is higher than that of regular cigarettes (43%) (ESPAD, 2019).

Cannabis is the most used illicit drug among European adolescents (ESPAD, 2019). The highest prevalence of lifetime cannabis use was reported by students from Czechia (28 %), Italy (27 %) and Latvia (26 %), in comparison with the European average of 16% (ESPAD, 2019). The general average remained stable from the last survey (ESPAD, 2015), such as data from Italy and Latvia. Czechia, Bulgaria, France and Monaco have seen a decrease of up to 10 percentage points from 2015 to 2019 (ESPAD, 2015; 2019). This development necessitates more inquiry to learn more about the reasons that may be influencing the declines. The average prevalence of current usage (last 30 days) remained constant (6.6% in 2015 and 7.1% in 2019), with six countries reporting considerable increases and Bulgaria and France reporting significant decreases (ESPAD, 2019). The highest rate of current cannabis use (15%) was observed in Italy with no differences between boys and girls (ESPAD, 2019). Early cannabis use is 2.4% (slightly lower than 2015 data) among Europeans (ESPAD, 2019). France and Italy reported the highest values (4.5% and 4.4%, respectively) (ESPAD, 2019). Data about high-risk cannabis use (measured with the Cannabis Abuse Screening Test) revealed that 4% of the sample was at risk for cannabis-related problems (ESPAD, 2019). The most worrisome figures were found in. France (7.3%), Germany (7.0%), the Czech Republic (6.4%) Slovenia (6.3%) and Italy (6.2%) (ESPAD, 2019). Recently, important changes to the regulations surrounding cannabis use have been made. For example, some American states have legalized the recreational use of cannabis. The effects of these reforms on cannabis use are still unclear, but they are cause for concern, especially if they lead to an increase in use in vulnerable populations such as minors (Cerdá et al., 2017; Pacula et al., 2015; Stevens, 2019; Waddell & Wilson, 2017). Even if the prevalence of cannabis use has remained

relatively stable, it must be considered that cannabis on the market in recent years is more potent than before and therefore more harmful to psychophysical health (EMCDDA, 2019).

Other illicit substances were also used by some students, albeit their rates of use were significantly lower than those for cannabis (ESPAD, 2019). Ecstasy (2.3% on average; 1.3% among Italians), amphetamine (1.7% on average; 1.1% among Italians), cocaine (1.9% on average; 2.3% among Italians), and LSD or other hallucinogens (2.1% on average; 1.2% among Italians) were the most commonly utilized illicit drugs (ESPAD, 2019). Methamphetamine (1.1% on average; 0.8% among Italians), crack (1.1% on average; 1.4% among Italians), heroin (0.9% on average; 0.8% among Italians), and GHB (0.7% on average; 0.5% among Italians) had lower lifetime prevalence rates than the other illegal substances (ESPAD, 2019).

As part of the phenomenon of polysubstance use, New Psychoactive Substances (NPS) was also included in the investigation by ESPAD (ESPAD, 2015, 2019). Indeed, most NPS users had tried other substances: 88% of them had tried at least another illicit drug; 84% had experienced cannabis use; 77% had engaged in binge drinking at least once in the last month; 45% had tried stimulants (ecstasy or amphetamine/ methamphetamine or cocaine/crack) (ESPAD, 2019). Even though they are not controlled by the United Nations drug conventions, generate concern about adverse health effects (ESPAD, 2019). Indeed, the increasing amount of people who are presenting in hospitals after using NPS, seem to have more severe and dangerous psychiatric and somatic effects than people who assume recognized substances with similar subjective effects (Brown et al., 2018; Logan, 2017).

Drug use among Italian adolescents is higher than European rate: 27% of Italians have used cannabis (16% in Europe) and 28% have used illegal drugs (17% in Europe) (ESPAD, 2019). In addition, 7% of European students have used inhalants (2% in Italy); 7% sedatives and tranquilizers without a prescription (4% in Italy); 4% painkillers (1% in Italy); and 1% anabolic steroids (1% in Italy) (ESPAD, 2019).

Policies about substance use

Through consistent monitoring over the years of adolescent habits and behaviors in several countries, it has been shown that stricter policies on the accessibility and availability of substances are effective in reducing their use: increasing prices, bans on advertisements, and establishing smoke- and alcohol-free zones (Anderson et al., 2009; Inchley et al., 2020; Jernigan et al., 2017; Raitasalo et al., 2020). Indeed, the report "Digital marketing of alcohol: challenges and policy options for better health in the WHO European Region (2021)" emphasized that limiting the marketing of alcohol is one of the "best buys" recommended by WHO to reduce alcohol consumption and the burden of alcohol-attributable disease (WHO, 2021). Policies on increasing alcohol prices were also associated with a reduction in binge drinking (Noel, 2019). Although international and national/regional prevention measures have resulted in encouraging reductions in adolescent smoking and drinking, current alcohol and cigarette use among older adolescents remains high (Inchley et al., 2020). Strict politics and regulations on alcohol advertisements, prices and availability were negatively associated with lifetime alcohol use, but not with current alcohol use (Noel, 2019). Furthermore, new challenges are emerging in the online world. Indeed, influencers and adolescents tend to post alcohol-related contents that easily spread around the world in a short time (Hendriks et al., 2020). Companies take advantage of this new type of marketing, which is not yet banned by national and international regulations, to advertise their brands (e.g., alcohol brand) through influencers who show that they like them on their social media pages (Gallopel-Morvan et al., 2017). Although alcohol seems to no longer represent a rite of passage into adulthood (Törrönen et al., 2019), the fact that influencers, who may function as role models, sponsor alcohol or other substance use could have a major effect on alcohol's reputation among young people. Therefore, more effort in terms of prevention is needed at this age. All the more reason because, during the transition from early to late adolescence, psychosocial well-being, physical activity, healthy eating habits, and happy school experiences all drop, while substance usage rises (Inchley et al., 2020).

Alcohol and binge drinking in adolescents

Alcohol represents the easiest drug to get and the most consumed by adolescents in Europe although it is strictly prohibited to sell alcoholic beverages to minors in most countries (ESPAD, 2019; Lima-Serrano et al., 2018; Rodrigues et al., 2018). Indeed, adolescents are more vulnerable to the consequences of alcohol use, resulting in brain development impairments (Kuntsche et al., 2017; Salmanzadeh et al., 2020), school and employment difficulties (Ellickson et al., 2003), involvement in incapacitated rapes (Testa & Livingston, 2009), intentional and unintentional injuries (Noh et al., 2011), sexual behaviors at an early age, unprotected sexual activities (Fergusson & Lynskey, 1996), delinquent and criminal behaviors (Ellickson et al., 2003). Although drinking alcohol in adolescence sometimes represents a transitional phase, previous research has shown that it can be a risk factor for substance abuse, alcohol dependence, and binge drinking later in life (Ellickson et al., 2003; Marshall, 2014; McCambridge et al., 2011; Salmanzadeh et al., 2020). Over the years, the consumption of alcohol has diminished, the abstainers have increased, but the prevalence of risky alcohol use and Binge Drinking has remained unchanged or increased (Charrier et al., 2020; de Looze et al., 2015; ESPAD, 2019; Inchley et al., 2002; Rodrigues et al., 2018; Vieno et al., 2018). Indeed, data from the last Health Behaviour in School-aged Children (HBSC, 2018) survey showed an increase in binge drinking among Italian 15-year-olds (+5% in males, +7% in females) compared to 2014 data (Canale & Charrier, 2019). Binge drinking represents a specific pattern of alcohol intake (5 or more alcoholic units on a single occasion) (ESPAD, 2019), which is very dangerous for psychophysical health, especially in adolescents in whom the alcohol dehydrogenase enzyme is deficient and the brain is more vulnerable to the effects of alcohol (Bourque et al., 2016; Kuntsche et al., 2017; Xiao et al., 2013). Involving 22.8% of males and 17.1% of females among Italian 11,13,15-years-old (HBSC, 2018), it is of utmost importance to prevent this phenomenon at an early stage until it grows up of control. Binge drinking then results in acute consequences, such as hangovers, blackouts, vomiting, unprotected and unintended sexual activities, disabilities, or death due to injuries (e.g., motor vehicle

accidents, violence, and homicide, self-harm, and suicide), and long-term consequences (e.g., poorer sleep quality, brain deficits, depressive symptoms) similar to those seen in chronic and addicted drinkers (Carbia et al., 2017; Ehlers et al., 2018; Kuntsche et al., 2017; Paljärvi et al., 2009; Salmanzadeh et al., 2020; Windle, 2004).

Adolescents who practice binge drinking, in comparison with their non-binge drinker peers, are more likely to be involved in unhealthy and risky behaviors such as the use of other psychoactive substances (e.g., marijuana, cocaine, inhalants) (Kuntsche et al., 2004; Miller et al., 2007; Rafanelli et al., 2016; Raposo et al., 2017; Salmanzadeh et al., 2020; White et al., 2015), ride with an inebriated acquaintance (van Beurden et al., 2005), have bad eating habits (binge eating, problematic weight loss or gain, unhealthy diet) (Brown et al., 2015), be involved in sexual activities (Miller et al., 2007) and physical fights (Miller et al., 2007), worsening the negative impact on their health.

Alcohol use habits among Italian adolescents

In Italy and other Mediterranean countries, the habit of drinking alcohol was typically moderate and part of the daily diet ('wet' culture), whereas in North European and North American countries, alcohol consumption was usually episodic and excessive ('dry' culture) (Alessandrini et al., 2018; Biolcati et al., 2016; Contel & Scalvedi, 2016; Graziano et al., 2012; Petrilli et al., 2014; Room, 2010). However, in recent years, the distinction between 'wet' and 'dry' cultures is disappearing (Katainen & Rolando, 2015). Indeed, in Mediterranean countries (including Italy), wine consumption is decreasing whereas the habit of drinking beer and spirits on an empty stomach, especially on weekends, is increasing (Alessandrini et al., 2018; Bräker & Soellner, 2016). At the same time, the number of adolescents and young adults who consume episodically excessive amounts of alcohol to experience its psychotropic effects (Alessandrini et al., 2018) is rising. Binge drinking (BD), a characteristic pattern of alcohol intake of American and Northern European countries, is becoming widespread among Italians as well (D'Alessio et al., 2006; Graziano et al., 2012).

It is becoming increasingly clear that investing in adolescence reaps triple rewards in terms of physical, social, and economic benefits for today's adolescents, tomorrow's adults, and future generations.

CHAPTER 2: BINGE DRINKING IN ADOLESCENCE

Binge drinking is a growing phenomenon in Italy but still little studied among adolescents, especially the youngest (13/14 years old). Most national and international researchers have been interested in the phenomenon in the population of college students, especially in the United States (Graziano et al., 2012; Kuntsche et al., 2004; Laghi et al., 2012a; Tucci et al., 2013). In Italy, underage drinking and purchase of alcoholic beverages is prohibited, but in daily reality alcohol consumption is widespread even among the youngest (Tucci et al.,2013; Villa et al., 2016).

How binge drinking and binge drinkers are defined

Binge drinking is a style of alcoholic beverages consumption, initially developed in Northern European countries and most prevalent among young people (Kuntsche et al., 2017). This term (i.e., binge drinking) is used to identify a mode of alcohol consumption that is episodic, excessive and concentrated in a short period of time in a consecutive manner (Ministry of Health, 2015, p.14). Binge drinking is translated in Italian as "abbuffata alcolica", but the English expression is more common and used also in Italy (Beccaria & Rolando, 2012). It is also usually called "heavy episodic drinking" (Laghi et al., 2012a). Other terms used as synonyms for binge drinking and heavy episodic drinking are risky single-occasion drinking and heavy sessional drinking (Biolcati et al., 2016). The number of alcoholic units that define a binge drinking episode are not always the same in research on the phenomenon (Laghi et al., 2012a). In Italy, but not in all countries, one alcoholic unit corresponds to 12 g of ethanol, that is approximately a 330 ml can of beer, a 125 ml glass of wine or a 40 ml shot of liquor. Some authors have investigated the by defining it as consuming 5 or more drinks on a single occasion (Abar et al., 2014; Clark et al., 2015; Lamis et al., 2012; Magidson et al., 2017). Heavy episodic drinking was also investigated by asking respondents how many times they had consumed 4 or more alcoholic drinks in a specific time frame (2 hours) (Masters et al., 2015). In some studies, heavy episodic drinking is investigated as the consumption of 4 or more drinks for females and 5 or

more drinks for males, consumed in a two-hour time period (Abar et al., 2014; Mushquash et al., 2013) or in a short period of time without specifying precisely (Chiauzzi et al., 2013; LaBrie et al., 2016). Many authors agree in detecting binge drinking by asking the respondent how many times he or she had 5 or more drinks/alcoholic beverages or alcoholic units on a single occasion (Guilamo-Ramos et al., 2004; Herrenkohl et al., 2012; Jager et al., 2015; Meier et al., 2007; Morgenstern et al., 2014; Oosterhoff et al., 2016; Patrick & Schulenberg, 2011; Pearson et al., 2013). Some authors differentiate alcohol quantity questions to define binge drinking by gender (usually 4 or more drinks for females and 5 or more drinks for males) due to metabolic and body mass differences between males and females, which for the same amount of alcohol ingested result in different blood alcohol levels (Gonzalez, 2012; Guilamo-Ramos et al., 2004; Marczinski et al., 2007; Norman & Wrona-Clarke, 2016; Quinn & Fromme, 2012; Vaughan et al., 2014). Thus, "heavy episodic drinking" and "binge drinking" can be used synonymously, but the use of the former term is often associated with a specific time frame (Abar et al., 2014; Masters et al., 2015; Mushquash et al., 2013). On the other hand, when heavy drinking does not have reference to episodes or a single occasion, it may indicate different types of alcohol consumption such as heavy episodic drinking, binge drinking, drunkenness, and peak drinking (Turrisi et al., 2007). Therefore, the terms used for the phenomenon may differ, but there is consensus in the scientific literature to define binge drinking as the consumption of 5 or more alcoholic beverages, sometimes differentiating quantities between males and females, on a single occasion (Gonzalez, 2012; Guilamo-Ramos et al., 2004; Herrenkohl et al., 2012; Jager et al., 2015; Marczinski et al., 2007; Meier et al., 2007; Morgenstern et al., 2014; Norman & Wrona-Clarke, 2016; Oosterhoff et al., 2016; Patrick & Schulenberg, 2011; Pearson et al., 2013; Quinn & Fromme, 2012; Vaughan et al., 2014). Clearly, a person who engages in binge drinking one to several times per month (the frequency of episodes may vary across studies) is defined “binge drinker”. Some authors prefer to classify "drinkers" into different categories, such as defining “social drinkers” those who drink alcohol moderately and only at social events (from 3-4 times per year to 3-4 times per week, but without presenting episodes of binge drinking); “binge drinkers” those who report at least

one but fewer than eight episodes of binge drinking in a month, or 1 to 4 episodes in two weeks; "heavy drinkers" those who report having more than eight episodes of binge drinking in a month, or more than 4 episodes in two weeks (Baiocco et al., 2008; Laghi et al., 2012).

Binge drinkers are predominantly males, middle and late adolescents, in fact the peak of binge drinking episodes occurs between the ages of 15 and 29 (Biolcati et al., 2016; Kuntsche et al., 2004, 2017). In contrast, among preadolescents and young adolescents, there are no significant differences between males and females (Ministry of Health, 2015). Binge drinkers are different from people who do not practice binge drinking in terms of motivations that lead to drink alcohol, which relate to the goal one wants to achieve, and expectations about alcohol, which relate to predictions about how one will feel (Bartolini et al., 2013; Biolcati et al., 2016; Graziano et al., 2012; Kuntsche et al., 2004; Laghi et al., 2012b; Oosterhoff et al., 2016). Regarding motivations, adolescents drink heavily to "get high", transgress, and experience something new, but they also use alcohol as a coping strategy when they have a problem they cannot face or negative emotions they cannot cope with (Bartolini et al., 2013; Biolcati et al., 2016; Graziano et al., 2012). In fact, binge drinking is also used by adolescents to momentarily reduce thoughts and emotions related to traumatic and stressful events (Oosterhoff et al., 2016). However, differences have emerged between males and females on the reasons that lead them to practice binge drinking. Indeed, males mainly binge drink for fun and to conform to the peer group, as opposed to females who do it mainly when they feel sad/irritated or to avoid thinking about their problems (Laghi et al., 2012b). Binge drinkers also have higher levels of positive expectations about alcohol (e.g., achieving behavioral and sexual disinhibition, being able to control anxiety and panic, and being facilitated in social relationships) and have lower negative expectations (e.g., nausea, mental confusion, headaches) than peers who do not practice binge drinking (Biolcati et al. 2016; Kuntsche et al., 2004; Laghi et al., 2012b). One expectation considered important among adolescents who drink high amounts of alcohol is improving sexual performance, which is considered very important among adolescent and young adult (Kuntsche et al., 2004, 2017). The expectations of binge drinkers are different from those who drink moderately; they most frequently report drinking to be

sexually uninhibited, for the excitement of taking risks, enjoying alcoholic games, but also to cope with problems and negative emotions (Kuntsche et al., 2004, 2017). The desire to take risks and feel strong emotions can also be a personality trait. Indeed, some personality traits are related to drinking alcohol, binge drinking and their consequences: impulsiveness; sensation seeking; sensitivity to anxiety and tendency to depression (Comeau et al., 2001; Conrod et al., 2008; Kuntsche et al., 2004). Specifically, binge drinking is often correlated with sensation seeking (sensation and adventure seeking) and drinking to reduce negative feelings is correlated with anxiety sensitivity and depression tendency (Comeau et al., 2001; Conrod et al., 2008). Binge drinkers are more impulsive and uninhibited than non-binge drinkers, and they also have greater difficulty controlling their behavior even after moderate alcohol intake (Marczinski et al., 2007). Moreover, the preferred alcoholic beverage characterizes the type of drinker: heavy drinkers prefer beer and hard liquor over wine (Graziano et al., 2012; Kuntsche et al., 2004), a trend that is characterizing Italian adolescents in recent years. A longitudinal, cross-cultural study involving Italy, Germany, Poland, and Scotland found that adolescents (mean age = 13.5 years) preferred advertisements for beer, rather than hard liquor or wine, and that having a preferred alcohol advertisement was correlated with binge drinking (Morgenstern et al., 2014). In addition, binge drinkers' favorite venues are discos, concerts, and sporting events, but also their own or friends' homes (Bartolini et al., 2013; ISTAT, 2016). Preadolescents and adolescents (11-17 years old) who attend nightclubs report more binge drinking (18.9%) than peers who do not (3.5%) (ISTAT, 2016). Heavy drinkers, therefore, attend places where it is more likely to drink alcohol (e.g., discos) and are less involved in activities where it is not common to use substances (Magidson et al., 2017). Differences between types of drinkers can also be observed when parental style (control and involvement, rules and punishments, family climate) is investigated. In a sample of Italian binge drinkers (mean age = 17 years), parental style is defined as less positive than those who drink less alcohol (social drinkers) and characterized by rigid and unpredictable punishments (Laghi et al., 2012a). Binge drinkers, moreover, would seem to belong to a medium-high socioeconomic class, in fact practicing binge drinking implies costs (Kuntsche et al.,

2004). Adolescents with more economic possibilities, with a higher pocket money or who work, show more episodes of binge drinking (Kuntsche et al., 2004).

There is little awareness of this phenomenon among adolescents: those who can be defined as binge drinkers for the amount of alcoholic beverages consumed in a single occasion (5 or more) define themselves as occasional drinkers, showing that they do not perceive the problematic nature of their alcoholic behavior (Laghi et al., 2012b; Stolle et al., 2009). They also appear to be less aware of their own physical health and do not perceive excessive drinking to be a problem compared to moderate and non-alcohol drinkers (Kuntsche et al., 2004).

Binge drinking versus drunkenness

Binge drinking does not always lead to drunkenness. Two different questions are usually used in studies and epidemiological surveys to investigate the phenomena (Beccaria & Rolando, 2012; Bosi et al., 2014; ESPAD, 2019; HBSC, 2018; Laghi et al., 2012b). However, in other research, binge drinking is defined as an intake of alcohol for the purpose of quickly achieving drunkenness, considering the two terms (binge drinking and drunkenness) as synonymous (Cecchini et al., 2015; Fiz Pérez & Ciancio, 2012; Lupi et al., 2013). Drunkenness assumes a different meaning than binge drinking among Italian adolescents (15- 19 years old), of whom 35% report episodes of binge drinking, while only 13% report episodes of drunkenness, the latter, in fact, has more negative connotation among young people than binge drinking (Bosi et al., 2014). Significant differences often emerge between data on Italian adolescents who report binge drinking and those who report getting drunk (Biolcati et al., 2016). In one study, two types of information to investigate heavy episodic drinking were used: an objective one (consumption of 4 or more drinks on a single occasion for females and 5 or more drinks on a single occasion for males) and a subjective one (asked to indicate how many times one got drunk in the previous 3 months) (Quinn & Fromme, 2010). In fact, it must

be remembered that objective measures do not take into account some variables (body weight, having drunk after eating or on an empty stomach, drinking fast, mixing different types of drinks) that influence state of drunkenness. Indeed, binge drinking may lead to drunkenness in some cases (e.g., drinking on an empty stomach) and not in other cases (e.g., drink the same quantities but during dinner) (Lupi et al., 2013).

Growth in alcohol use and binge drinking during adolescence

Alcohol consumption, as well as binge drinking, usually increases during adolescence, peaking around age 22 and then decreasing (ISTAT, 2016; Jager et al., 2015; Patrick & Schulenberg, 2014; Wilkinson et al., 2016). The prevalence of binge drinking at ages 18, 22, and 26 is 35%, 51%, and 44% among males and 23%, 35%, and 27% among females, respectively (Jager et al., 2015). It was found an increasing trend among the younger population as well: adolescents who reported drinking alcohol were 19% of 11-year-olds, 42% of 13-year-olds, and 75% of 16-year-olds, and those who got drunk in the previous month were 4%, 14%, and 40%, respectively (Meier et al., 2007). Binge drinking in the previous two weeks was reported by 6% of 13–14-year-olds, 15% of 15–16-year-olds, and 22% of 17–18-year-olds (Patrick & Schulenberg, 2014). Among Italian adolescents, binge drinking has been found to be less prevalent among 14–19-year-olds than 20–29-year-olds (Bartolini et al., 2013). Among a sample of Italians, 14% of 11-year-olds, 22% of 13-year-olds, and 39% of 15-year-olds practiced it (Cecchini et al., 2015). The same upward trend was reported by Fiz Pérez and Ciancio (2012): 19.9% among 11- to 15-year-olds; 54.7% among 16- to 17-year-olds; and 69.6% among 18- to 19-year-olds. The downward trend from middle to late adolescence and adulthood could be explained by the higher tolerance that adolescents have towards alcohol. In fact, young adolescents experience more positive effects (euphoria, energy) than negative ones (headache, nausea), obtaining a positive reinforcement that leads them to drink even more (Marshall, 2014).

However, Oosterhoff and colleagues (2016) found different trajectories regarding binge driking episodes in a sample of adolescents (mean age 16 years-old). Four possible trajectories have been described by the authors:

-*High Increasers* (low level at baseline, high accretion during 6 years);

-*Adolescence Elevated* (high level at baseline, reduction during 6 years);

-*Mid-Tier Stable* (medium level at baseline, moderate growth during 6 years);

-*Slight Increasers* (low level at baseline, slight growth during 6 years).

Therefore, although there is a common growth trend among adolescents, subjective differences must always be considered to better understand which populations are most at risk.

Risk and protective factors

Different risk factors have been investigated in order to intervene as early as possible going to reduce and prevent excessive consumption of alcohol. At the same time, protective factors have been explored to be able to increase them as they act on reducing risk and / or increasing well-being. Risk factors and protective factors concern both the genetics of the individual and the characteristics of the environment in which he or she is inserted in a bidirectional manner (Zimmermann et al., 2007). Therefore, it is necessary to investigate the phenomenon from a multifactorial perspective. Environmental factors would explain better the onset of binge drinking and alcohol-related problematic behaviors, while genetic factors seem to be more involved in the frequency and development of these habits (Kuntsche et al., 2004). Indeed, in a sample of American adolescents with alcoholic parents it was noted an increase in the frequency of binge drinking only in the group of males who had friends who drink alcohol, used drugs and had externalizing behaviors and not in the group of females with anxiety and depressive problems (Kuntsche et al., 2004). However, Marshall's (2014) study found a genetic predisposition. In fact, people who came from a family with

a history of alcohol use had a significantly higher risk of developing alcohol dependence than those who came from a family without such issues (Marshall, 2014). The environment in which the adolescent lives has also a huge importance. In fact, 2016 ISTAT data showed that preadolescents and adolescents who live in a family in which at least one parent had an excessive alcohol habit were more likely to present less moderate drinking patterns (30.5% of 11–24-year-olds) than peers who lived in a family in which no alcohol or moderate drinking occurred (16.2% consume alcohol in a non-moderate manner). Adolescents living in a household in which one or more members abused alcohol reported, with high probability, episodes of binge drinking (Kuntsche et al., 2004). Marshall's (2014) review also showed that being in close contact with a family member who drunk and get drunk, not just a parent but also a brother or sister, uncle or aunt, was a risk factor for problematic alcohol use. When alcohol is drunk within the family, it is more accessible, and this easier accessibility can be a risk factor for increased use (Marshall, 2014). Drinking alcohol in the family makes it more available to adolescents and brings out an approval towards it, increasing problematic use among members (Mushquash et al. 2013). In adolescence, the importance of peer group on behaviors can be seen in different contexts. For instance, adolescents who had more friends who drink alcohol reported more episodes of binge drinking, especially if their friends drink heavily or show approval of such behavior (Marshall, 2014; Kuntsche et al. 2004; Laghi et al., 2012a). Behaviors and approval of people who live in close contact with adolescents influence their thoughts and behaviors. Another factor that increases alcohol use is overestimating peer use: those who drink alcohol in greater quantities tend to overestimate their peers' use (Haug et al., 2017; Laghi et al., 2012a). The tendency to overestimate the number of peers who drunk alcohol and the amounts drunk is one of the strongest predictors for alcohol use among adolescents aged 16-19 years (Chiauzzi et al., 2013). Among younger adolescents (12-19 years old), alcohol use and abuse tend to resemble that of their own friends, a similarity that diminishes when entering into a romantic relationship (DeLay et al., 2016). On the other hand, living environment can also act as a protective factor. When adolescents perceive that their parents do not show approval towards alcohol consumption, they drink less and

are less involved in binge drinking episodes than adolescents who perceive greater parental approval (LaBrie et al., 2016). A good bond with the mother also acts as a protective factor on the amounts of alcohol consumed by daughters, as found in a study by Smorti and Guarnieri (2015) on a sample of adolescents aged 16 to 20 years. In contrast, the presence of depression or depressive symptoms in the mother predicted an earlier onset of both alcohol use and binge drinking in her sons (Lamis et al., 2012). Perceived lack of parental control over their behaviors also leads to increased alcohol use (Han et al., 2010; Marshall, 2014). Freeman and colleagues (2010) found that the relationship between negative family environment and excessive alcohol use can be mediated by the perception of a positive school environment. Within a positive school climate (e.g., relationships with teachers, peers), adolescents achieve greater academic success, which in turn is a protective factor and is negatively correlated with the onset of risky behaviors, such as alcohol abuse (Flory et al., 2004; Patrick & Schulenberg, 2014; White et al., 2014). Conversely, lack of a sense of school community is found to be correlated with substance abuse (Zani, 2012). The context in which one lives may also increase or decrease vulnerability to binge drinking. For example, living in rural areas may increase binge drinking as adolescents experience more states of boredom due to the limited opportunities and alternatives offered by these areas to spend leisure time (Biolcati et al., 2016). The tendency to be bored predicts motivations to drink (i.e., feeling more secure within social relationships, gaining sexual disinhibition, and alleviating distress) which in turn predict greater involvement in binge drinking (Biolcati et al., 2016). Furthermore, bored adolescents tend to binge drink because of its physical and psychological effects (sexual disinhibition and reduced suffering) rather than its social effects (Biolcati et al., 2016). In addition, the type of expectations about alcohol (i.e., sexual disinhibition, reduction in suffering, conforming to peer group) can act as a risk or protective factor towards binge drinking (Bekman et al., 2011; Biolcati et al., 2016; Gunn & Smith, 2010; Marshall, 2014). Having positive expectations toward alcohol use (e.g., alcohol makes one more sociable, makes one feel euphoric, reduces anxiety and boredom) predicted the onset of problem drinking and increased alcohol use in adolescence, even among preadolescents (Bekman et al., 2011; Biolcati et

al., 2016; Gunn & Smith, 2010; Marshall, 2014). Therefore, it is important to investigate adolescents' expectations because of its predictive effect on alcohol use (Meier et al., 2007). Believing that alcohol and drugs are not particularly harmful to health predicts more substance use, because of an underestimation of the risks in the short and long term (Chiauzzi et al., 2013). In contrast, young adolescents who believed there were high risks in substance use (e.g., leads to addiction, worsens physical and mental health) reported fewer episodes of binge drinking and used fewer substances in late adolescence (Bekman et al., 2011; Yan & Brocksen, 2013). Another relevant predictor is the early age at which one has their first alcoholic drink, which predicts alcohol abuse and dependence: 13.5% and 15.9% of those who had had their first drink between the ages of 11 and 12 were diagnosed with of alcohol abuse and alcohol dependence 10 years later, respectively (Gunn & Smith, 2010). Starting drinking at an early age in the family environment or outside with peer group does not lead to the same problems: starting moderate drinking in the family is a protective factor with respect to binge drinking and other alcohol-related problems (Laghi et al., 2012a; Smorti & Guarnieri, 2015). In a sample of Italian preadolescents (92% aged 12-13 years), 73% drank their first time with family members, while 18% drank with peers (Tucci et al., 2013). Italy, in fact, differs from other countries (especially northern Europeans) in the habit of starting to drink at home, in the family setting. This aspect represents a protective factor against alcohol abuse at an older age as it occurs in gradual ways, under the watchful eye of parents and grandparents, and usually not in large quantities (Beccaria & Rolando, 2012; Graziano et al., 2012; Kuntsche et al., 2004; Laghi et al., 2012a; Smorti & Guarnieri, 2015). The type of alcoholic beverage also predicted the amounts of alcohol consumed: beer and hard liquor led to the consumption of high amounts of alcohol among European adolescents who prefer them during binge drinking episodes (Kuntsche et al., 2004).

The characteristics and skills of the adolescent are also important. Indeed, a protective factor was self-regulation, which represents the ability to control thoughts, emotions and behaviors in order to achieve a specific goal and the ability to postpone gratification and to be able to resist temptations (Dich et al., 2015; Quinn & Fromme, 2010). Moreover, Gunn and Smith's (2010) study found that

high levels of three personality traits (negative urgency, positive urgency, and sensation seeking) were present in preadolescents who consume alcohol. The tendency to act impulsively when experiencing distress or a very positive mood (negative and positive urgency) significantly predicted problem drinking; the tendency to seek ever new and exciting experiences (sensation seeking) predicted the frequency of alcohol use among young adults (Gunn & Smith, 2010).

Life events, such as having experienced one or more traumas during childhood or preadolescence, also increased alcohol use among 14-year-olds (Layne et al., 2014). Exposure to violence (e.g., witnessing a shooting or stabbing, being involved in a fight that results in serious injury) can lead to increased episodes of binge drinking which, in turn, lead to worse adjustment outcomes (low life satisfaction, lower levels of education, high levels of delinquency, lower levels of physical health) (Oosterhoff et al., 2016). Events experienced as traumatic and stressful increased vulnerability to enacting more binge drinking episodes; in fact, even the transition from high school to college, which can be configured as a more or less stressful event, was characterized by an increase in alcohol and drug abuse (Chiauzzi et al., 2013; Cleveland et al., 2012).

Short and long-term consequences on physical, social and mental health

The consumption of alcohol, especially if excessive (eg., binge drinking), is associated with harmful biopsychosocial consequences both in the short (traffic accidents; injuries; fights; dangerous behaviors; worse cognitive functioning; mood swings; worsening physical well-being; intoxication; coma; death) and in the long term (diagnoses of alcohol abuse and dependence; alcohol-related chronic diseases; problems in the relational and sentimental spheres; memory deficits; psychiatric disorders) (Benner & Wang, 2015; DeLay et al., 2016; Fiz Pérez & Ciancio, 2012; Haug et al., 2017; Lupi et al., 2013; Oesterle et al., 2004; Tucci et al., 2013; Vieno et al., 2013). Alcohol use is related to more than 60 dysfunctions and diseases such as cancer, infertility, gastrointestinal, immunological, vascular, skeletal system disorders, injuries, homicides, suicides, traffic and other accidents,

behavioral and psychiatric disorders, and severity is positively correlated with alcohol consumption (Ministry of Health, 2015). Larger amounts correspond to more severe and more numerous consequences, especially in particular groups of people: pregnant and lactating women; older people; minors; and people with prior histories of addiction (Ministry of Health, 2015). The consequences of alcohol depend on the psychophysical state of those who use it. Indeed, it has more harmful effects on women than men for a number of factors including lower body weight, more adipose tissue and less water in the body, lower functionality of the enzyme alcohol dehydrogenase (the main enzyme responsible for the elimination of ethanol, toxic to organs) (Cecchini et al., 2015). It is even more harmful among minors, in whom alcohol dehydrogenase is deficient until 16-18 years of age, making any amount of alcohol toxic to the body (Cecchini et al., 2015). Furthermore, alcohol intake at an early age can lead to problems at the neuronal level as the brain continues to mature until age 20-25 years-old, making it more sensitive to environmental inputs and therefore also more vulnerable to the effects of alcohol (Stolle et al., 2009; Xiao et al., 2013). In fact, adolescents who use alcohol show different brain activity than those who do not consume alcohol during working memory and verbal learning tasks (Xiao et al., 2013). Moreover, binge drinkers show worse performance than those who never drank (Xiao et al., 2013).

Alcohol has a strong short- and long-term impact on cognition, particularly concentration, learning, and memory, up to and including frontal lobe and working memory lesions (Cleveland et al., 2012; Lupi et al., 2013; Oosterhoff et al., 2016). In a longitudinal study comparing mnemonic abilities among binge drinkers, non-binge drinkers, and ex-binge drinkers (those who have engaged in binge drinking but later stopped), it was found that binge drinkers had the most difficulty, especially in immediate and delayed recall of a memory, whereas some recovery was seen in the abilities of ex-binge drinkers (Carbia et al., 2017).

Binge drinking, taking the form of a type of excessive alcohol consumption, leads to serious physical, behavioral, psychiatric, and social consequences (Quinn & Fromme, 2010), as well as on adaptation and life goals, such as worse school success (Cleveland et al., 2012; Oosterhoff et al., 2016). Binge

drinking, harmful in itself, if carried out by young people represents a very dangerous behavior for mental, physical and social health (Oosterhoff et al., 2016; Quinn & Fromme, 2010). In fact, the consequences of binge drinking depend on the age of onset of the phenomenon, but also on the frequency with which it is practiced (Oesterle et al., 2004). Those who had never had an alcoholic binge in adolescence, at 24 years old had fewer health problems and manifest more healthy behaviors than peers who reported alcoholic binges (Oesterle et al., 2004). Specifically, adolescents who had reported binge drinking episodes throughout adolescence had serious health problems at age 24 such as greater overweight or obesity and higher blood pressure levels; adolescents who had begun binge drinking around age 16 reported less likelihood of driving safely and greater likelihood of becoming ill (Oesterle et al., 2004). Thus, practicing binge drinking for a longer period during adolescence was related to more severe biopsychosocial problems (Oesterle et al., 2004). In addition, starting drinking early predicted the development of substance use and alcohol-related problems in later years (Gunn & Smith, 2010; White et al., 2015). Regardless of age, several studies have found that those who engaged in binge drinking reported more antisocial and violent behaviors, gambling, sexual assault and unprotected sexual activity, accidents, and injuries, to a greater extent than those who did not drink in this modality (Jackson & Sher, 2008; Norman & Wrona-Clarke, 2016; Oosterhoff et al., 2016; Quinn & Fromme, 2010; Tomberg, 2010). Binge drinking explains more than 80% of traffic crashes caused by driving under the influence of alcohol (Tomberg, 2010). In addition, alcohol is the substance most associated with DFSA (Drug Facilitated Sexual Assault), a phenomenon involving sexual acts with people who are in a state of unconsciousness or inability to react due to substance abuse (Villa et al., 2016). In a sample of Italian adolescents (aged 15-21 years-old), 12.7% reported having been a victim or witness to a DFSA (Villa et al., 2016). Sexual assault in adolescence leads to an increased likelihood of being diagnosed with post-traumatic stress disorder, major depression, or alcohol use and abuse (Villa et al., 2016). This whole series of consequences of binge drinking in the youth population had also increased hospitalizations, as shown by data from the hospital of Bologna in which hospitalizations of drunk youth increased by 100 in one year (Fiz Pérez & Ciancio, 2012)

and binge drinking was the form of alcohol intake that was most associated with emergency hospitalizations (Tomberg, 2010). Indeed, acute problems involving the consumption of large amounts of alcohol with the purpose of experiencing the psychoactive effects of the substance had increased in the younger age group (Beccaria & Rolando, 2012). Alcohol-related problems are further worsened by drug use, and several studies have shown that those who consume alcohol excessively (e.g., binge drinking) also report greater drug use, increasing the severity and number of negative consequences (Chiauzzi et al., 2013; D'Amico et al., 2001; Kuntsche et al., 2004). Specifically, among U.S. adolescents (13-18 years of age), the use of cigarettes, marijuana, and other drugs was greater among those who presented episodes of binge drinking, which as a percentage affects 61%, 59%, and 34%, respectively, compared to 34%, 28%, and 10% of those who were not binge drinkers (D'Amico et al., 2001). The same trend was observed for the frequency of cigarette smoking and binge drinking in a sample of Italian university students and in a sample of Finnish adolescents (Kuntsche et al., 2004). When excessive alcohol consumption was found, one must also go to investigate the use of other legal and illegal substances or drugs because it could be a potential indicator of the presence of polysubstance use.

Social consequences of alcohol also include health care costs. Over the years, there has been an increase in the number of people who are taken care of by the Services dedicated to alcohol-related problems (Ministry of Health, 2015). In 2013 and 2014, in Italy, users of these services have been 69.880 and 72.784, respectively (Ministry of Health, 2015). In addition, the pharmaceutical expenditure (in 2014) borne by the Italian National Health Service for medicines used in the treatment of alcohol dependence amounted to 8,114,569 euros (Ministry of Health, 2015).

The ultimate and most serious consequence of binge drinking is represented by death. According to the Italian National Institute of Health (Istituto Superiore di Sanità), deaths due to alcohol in 2008 concerned 3.8% of males and 2.1% of females, with higher data among younger people (16.65%). Deaths are mainly due to accidental causes (e.g., traffic accidents) (Beccaria & Rolando, 2012). It cannot always be determined whether a death is alcohol-related, but it has been estimated that

approximately 1800 college students die each year from alcohol-related accidents, such as alcohol intoxication, traffic accidents, drowning, and falls (Pearson et al., 2013). In addition, the WHO's "Global Report on Alcohol and Health 2014" showed that 5.9% of all deaths, corresponding to 3.3 million people worldwide, were attributable to alcohol use. It also led to 5.1% of life years lost due to illness, disability, and premature death (Disability Adjusted Life Years, DALYs).

Binge drinking and lifestyle

Lifestyle includes various activities and habits that may relate to the type of diet followed, physical activity and sports, substance use, socioeconomic status, leisure time, work and school activities. In the majority of cases, those who follow a healthy lifestyle implement adjustments in the various dimensions of daily life and, in contrast, unhealthy lifestyles often present in comorbidity (Cuenca-García et al., 2013). For example, comorbidity between substance use is often found (D'Amico et al., 2001; Kuntsche et al., 2004; Stolle et al., 2009; White et al., 2015): approximately half of a sample of 14-15-year-old New Zealanders who reported taking one substance among tobacco, alcohol (binge drinking), and cannabis in the past 30 days were also taking another (White et al., 2015). Some adolescents, on the other hand, enact compensatory behavior to reduce the negative impact of their unhealthy lifestyle, such as engaging in more physical activity to compensate for the calories taken in by binge drinking (Giles & Brennan, 2014).

Socioeconomic status

Family socioeconomic status, which includes information about income, parental education level, and parental occupation, emerged to be both a risk and protective factor toward alcohol use among adolescents. Adolescents who lived in poverty and experienced higher levels of environmental stressors (parental unemployment, poverty, living in blighted neighborhoods) had higher levels of allostatic load (Theall et al., 2012) and more episodes of binge drinking (Zimmermann et al., 2007).

A literature review of longitudinal studies also found that low socioeconomic status during childhood led to alcohol abuse in the future (Wiles et al., 2007). But it emerges that a high to middle socioeconomic level was also correlated with greater alcohol use (ISTAT, 2016; Kuntsche et al., 2004). The 2016 ISTAT data showed that higher alcohol consumption among adolescents was associated with higher parental educational attainment (high school diploma and college degree), just as greater economic affluence was associated with risky consumption in their children. Presumably, having higher income leads to greater financial readiness of adolescents to purchase alcohol. In fact, adolescents with greater liquidity, due to higher levels of pocket money or because they work, also exhibited the highest levels of binge drinking (Kuntsche et al., 2004). Furthermore, the ease with which one obtains alcohol, due in part to possessing money to buy it, was a risk factor for excessive consumption (Marshall, 2014). Accordingly, both associations emerge from the data available in the literature: the first assumes that alcohol use is consequent to higher levels of stress and allostatic load perceived within a poorer context (both economically and culturally), while the second justifies more frequent alcohol use with greater economic availability to purchase it.

Sport and physical activity

A low rate of adolescents (less than 20%) engages in physical activity consistent with WHO recommendations (60 minutes of moderate-to-vigorous physical activity daily) (Inchley et al., 2020). Since 2014, the trend has been downward (Inchley et al., 2020). As age increases, involvement in sports and physical activity decreases. On the positive side, compared to 2010, more adolescents are practicing sports (especially among the youngest). Physical inactivity is part of unhealthy lifestyle and, considering that several studies have shown a comorbidity between unhealthy behaviors (Cuenca-García et al., 2013; D'Amico et al., 2001; Kuntsche et al., 2004; White et al., 2015), this would explain a positive correlation between binge drinking and lower physical activity detected among adolescents (Kopp et al., 2015). However, there are several studies that indicate a positive

correlation between binge drinking and sports (Doumas et al., 2007; Martens et al., 2005; Rowland et al., 2012; Turrisi et al., 2007). Those who practice sport were more engaged in binge drinking (Doumas et al., 2007; Martens et al., 2005; Rowland et al., 2012; Turrisi et al., 2007). Specifically, in England, those who played sports consumed more alcohol than those who did not; in New Zealand, rugby players reported higher levels of harmful consumption; in America, college athletes reported heavy consumption compared to other students; and in Australia, 34% of sports club members had 5 or more drinks during games (Rowland et al., 2012). Athletes, compared to non-athletes (in a sample of college students), had more problematic alcohol use: greater episodes of binge drinking, drunkenness, greater amounts of alcohol intake per week, and more alcohol-related problems (Martens et al., 2005; Turrisi et al., 2007). Higher levels of physical activity related to binge drinking and problem drinking can be explained as a compensatory response to high alcohol intake, and therefore calories (Giles & Brennan, 2014), but other possible explanations emerge from different studies (Doumas et al., 2007; Drane et al., 2017; Martens et al., 2005; Turrisi et al., 2007). In a study by Doumas and colleagues (2007), involving first-year college students, athletes had higher levels of problematic alcohol intake than non-athletes. This association was explained by the higher level of stress perceived by athletes when faced with academic and sporting requests, the greater number of social events they were involved in, and the tendency not to ask for help when faced with problems (Doumas et al., 2007). Drane and colleague found that among adolescents who participated in sports, binge drinking tent to increase with the number of “high-risk” athletic peers (those who drink alcohol, use drugs, and miss school days). Considering that sensation seeking and hanging out with friends who drink alcohol were correlated with greater alcohol use, and that sports were often played by people who want to experience new and exciting thrills and activities all the time, sports environment could be a risk factor for binge drinking (Drane et al., 2017). Athletes, compared to non-athletes, reported a greater amount of time spent socializing with peers, both during and after sports and this could lead to greater peer influence (Turrisi et al., 2007). Athletes also reported other factors that could explain greater alcohol consumption: they had higher perceptions of alcohol use by peers,

greater social approval, greater availability of alcohol, and offers to drink (Turrisi et al., 2007). However, when parents of athletes explain to their children the negative consequences of alcohol on physical health, problematic alcohol use was lower than in the sample of non-athletes who receive the same information, probably because those who play sports are more concerned about their performance and physical health (Turrisi et al., 2007). On the other hand, no correlation between physical activity and alcohol consumption emerged in an Austrian sample (15 years and older) when the whole sample has been considered (Kopp et al., 2015). However, the correlation between low levels of physical activity and high alcohol consumption among younger males was significant, but also between high levels of physical activity and alcohol consumption (Kopp et al., 2015). Thus, playing sports at high and low levels, compared to moderate activity, was correlated with higher alcohol consumption (Kopp et al., 2015). Furthermore, the presence of a relationship between sports and alcohol in males, but not in females, suggests that it is certain types of sports (such as team sports) and higher levels of competition (greater in males) that contribute to explain this type of relationship (Kopp et al., 2015). Indeed, it appeared that exercise was negatively correlated with alcohol use, whereas participating in team sports was positively correlated, especially in males (Patrick & Schulenberg, 2014).

Diet and nutrition

In Italy, the diet of adolescents is less healthy among 13–15-year-olds than among 11-year-olds (HBSC, 2018). In fact, among older adolescents there was the lowest percentage of those who report eating breakfast and fruits and vegetables every day and there was the highest percentage of consumption of sweets and sugary drinks (HBSC, 2018). Previous studies have shown an association between unhealthy eating habits and alcohol consumption, in line with the tendency to associate unhealthy behaviors (Lupi et al., 2013). A survey of young adults (18-29 years old) found that binge drinkers consumed more fried foods than non-drinkers (Mohamed & Ajmal, 2015). However, a

correlation was also noted between binge drinking, frequency with which alcohol is drunk, and restrictive diets (Lupi et al., 2013). It is likely that binge drinkers follow a more restrictive diet to compensate for the high number of calories taken in with alcohol. Indeed, in a study by Giles and Brennan (2014), three behaviors regarding lifestyle of young adults (19-26 years old) were investigated and it was found that, in order to stay healthy, they adopt healthy lifestyles in one of the behaviors but not in the others. They prefer to increase physical activity levels to compensate for caloric intake from binge drinking or unhealthy diets (few fruits and vegetables, junk food) or they adopt healthier diets to compensate for calories from binge drinking and low frequency of physical activity (Giles & Brennan, 2014). In addition, it has been found that binge drinking is more common among those who have an eating disorder or are at risk of developing one (Ocampo Ortega et al., 2012). More impulsive girls were more likely to have an eating disorder as well as binge drinking. (Ocampo Ortega et al., 2012). In a sample of female college students, binge drinking correlated with both weight control behaviors and purging (self-induced vomiting, use of laxatives, diuretics, and enemas) (Kelly-Weeder, 2011). This association between binge drinking and restrictive dieting, weight control behaviors, purging, and eating disorders was more frequent among females than males (Kelly-Weeder, 2011; Ocampo Ortega et al., 2012). In line with this data, the 2010 HBSC survey found that as girls age, the number of girls who consider themselves "fat" increases (42% of 15-year-olds), as do weight-loss diets. Indeed, despite the fact that binge drinking is more practiced by male adolescents, there are no gender differences regarding empty stomach drinking, which is probably a strategy to get the blood alcohol level up sooner or a compensatory behavior to avoid weight gain, in line with higher attention that girls report towards weight and fitness (Biolcati et al. 2016). In recent years, a very dangerous health phenomenon is emerging, which associates anorexia with binge drinking (defined as drunkorexia by the "NewYork Times") (Lupi et al., 2013). This phenomenon, characterized by forced fasting, use of laxatives or self-induced vomiting, obsession with physical appearance and excessive consumption of alcohol, makes people immediately and more intensely

perceive the psychoactive effects of the substance without leading to weight gain, with very serious consequences for health (Lupi et al., 2013).

School achievement

School performance is usually indicated as the average of school grades and achievements (e.g., diploma), but also as dropouts and failures. In Italy, vocational institutions report a high rate of failures and dropouts, which are not found in technical institutes and high schools (Palmonari, 2011). Achieving success in school has an important impact on students' lives, e.g., good school performance increases positive emotions (Palmonari, 2011). A positive attitude toward school also showed to be a protective factor on alcohol and drug use (Patrick & Schulenberg, 2014). In contrast, students with poorer performance were more likely to engage in binge drinking episodes (Kuntsche et al., 2004; Patrick & Schulenberg, 2014; White et al., 2015; Yan & Brocksen, 2013). In fact, binge drinking is correlated with negative school outcomes such as worse academic performance, leaving school before finishing (dropping out), taking longer to graduate, and being less likely to get into college (Kuntsche et al., 2004; Patrick & Schulenberg, 2014; White et al., 2015; Yan & Brocksen, 2013). The relationship between binge drinking and worse academic performance could be explained bidirectionally: worse academic performance leads to more binge drinking episodes and greater involvement in binge drinking episodes worsens academic performance (Patrick & Schulenberg, 2014). It emerged that greater substance use, negatively affecting cognitive performance, led to worse school performance (Patrick & Schulenberg, 2014). In fact, binge drinkers report the worst performance on tasks requiring mnemonic skills (Carbia et al., 2017), and several studies have highlighted how alcohol reduces cognitive abilities, especially learning, memory, and concentration that are critical to performing well in school (Cleveland et al., 2012; Lupi et al., 2013; Oosterhoff et al., 2016). Adolescents who binge drank during their high school years reported less academic success and were more likely to engage in risky behaviors, up to and including engaging in delinquent

behavior (Oosterhoff et al., 2016). A longitudinal study conducted with U.S. adolescents showed that those who believed substances had negative and dangerous effects used them less in later years, reporting fewer episodes of binge drinking and greater academic success (Yan & Brocksen, 2013). Therefore, a lack of awareness of the negative effects of binge drinking leads to a continuation of the behavior and a worsening of school performance. Indeed, there are worrisome data regarding an Italian study that showed that adolescents (16-18 years old) had a low awareness of the negative effects of binge drinking and the way they consume alcohol (they defined themselves as occasional consumers even though they practiced binge drinking) (Laghi et al., 2012a).

Binge drinking and psychological correlates

Anxiety and depression

Substance use, such as binge drinking, is correlated with depressive symptoms in adolescence and both phenomena trend upward from early to late adolescence (Bekman et al., 2013; Benner & Wang, 2015; Patrick & Schulenberg, 2014; Pitkänen, 1999; Wilkinson et al., 2016). The literature suggests that adolescent girls experienced more depressive and anxiety symptoms than boys, but the latter were more involved in substance use and abuse (Mason-Jones & Cabieses, 2015; Wilkinson et al., 2016). Binge drinkers (aged 18–29-year-olds) reported higher levels of depression than non-binge drinkers (Mohamed & Ajmal, 2015), but "lonely" binge drinkers (drink primarily alone) showed higher levels of depression and suicidal ideation than "social" binge drinkers (drink primarily with others) (Gonzalez, 2012). The frequency with which adolescents (14-16 years old) engaged in binge drinking was also positively correlated with the presence of depressive symptoms (Wilkinson et al., 2016). Adolescents who had high alcohol consumption had higher levels of anxiety than peers who did not abuse alcohol (Mason-Jones & Cabieses, 2015; Pitkänen, 1999). To understand whether anxiety and depression are risk factors or consequences of alcohol use, Bekman and colleagues (2013) conducted a study in which binge drinking and symptoms of anxiety and depression were measured

at baseline and subsequently over 4-6 weeks of alcohol abstinence: no improvement in anxiety and depression was found during weeks of abstinence. On one hand, this result could be explained by the self-medication model according to which negative mood predicts alcohol consumption and therefore persists even in its absence (Bekman et al., 2013). On the other hand, it is possible that the weeks considered were not sufficient to record an improvement in mood (Bekman et al., 2013).

Explaining the correlation between anxiety/depressive symptoms and binge drinking have two models: self-medication model and stress model (Wilkinson et al., 2016). According to the self-medication model, it is the depressive and anxious symptoms that lead the adolescent to adopt excessive alcohol use behaviors, such as binge drinking, to cope with emotional distress; in fact, the relationship is mediated by the coping strategies possessed by the individual (Kuntsche et al., 2004; Wilkinson et al., 2016). Several studies have found that depression and anxiety, as well as loneliness, tension, stress, and general emotional distress, predicted greater involvement in binge drinking episodes (Kuntsche et al., 2004; Marshall, 2014). This hypothesis is in line with data from Marshall's (2014) study in which 11-year-old adolescents with depression reported greater substance use than peers at age 14. Moreover, Benner and Wang's (2015) study found that lower attachment to school and greater depressive symptoms led to elevated alcohol and marijuana use in students between the ages of 17 and 18 (Benner & Wang, 2015). In contrast, according to the stress model, depressive and anxious symptoms are a secondary consequence of substance use and binge drinking (increased relational conflicts in the family and with peers, social isolation, stress in interpersonal relationships, at school, and at work) (Wilkinson et al., 2016). In a longitudinal study involving a representative sample of Americans followed from preadolescence to adulthood, the pattern of self-medication was confirmed for marijuana use but not for binge drinking (Wilkinson et al., 2016). Those with greater depressive symptoms reported more frequent marijuana use later in life, but not more frequent episodes of binge drinking (Wilkinson et al., 2016). In the same study, the stress model for binge drinking episodes and marijuana use was confirmed, with a stronger relationship in females than males (Wilkinson et al., 2016). Indeed, those who reported more binge drinking episodes and more

marijuana use reported more frequently depressive symptoms in the future (Wilkinson et al., 2016). Depression, in fact, can be a consequence of heavy drinking, as in the phenomenon of binge drinking (Lupi et al., 2013).

Distress and allostatic overload

Stress is a widely studied phenomenon and initially theorized as a set of negative life events that inevitably led to negative consequences on the psychophysical health of the individual (Grandi et al., 2011). There have been several studies on the phenomenon that have also brought out the positive aspect called “eustress” (activation of the body to deal with an event perceived as an opportunity for growth that will lead to positive outcomes and greater well-being), as opposed to “distress” which is instead harmful and damaging to psychophysical well-being (the stressor is perceived as a threat to one's well-being) (Grandi et al., 2011). Moreover, stressful events can occur as easily identifiable and short-lived episodes (acute stress) or as a set of milder and more protracted events (chronic stress), and both have an impact on the individual's psychophysical well-being (Grandi et al., 2011). The positive or negative valence of a given event, thus perceiving it as an opportunity or a threat, depends on the cognitive evaluation of the event, but also on its objective value (Grandi et al., 2011). There are situations that are perceived as stressful (distress) by some people but not by others. This interindividual variability depends on a number of factors: the importance of the stressor for the individual's psychophysical well-being and the type of consequences (positive or negative) on it; the objective characteristics of the stressor (desirability and controllability of the situation); the resources possessed by the individual to deal with that particular situation; and characteristics of the individual such as self-esteem or negative emotionality (Dich et al., 2015; Grandi et al., 2011). Negative emotionality, defined as a predisposition to experience emotions of anxiety, fear, irritability, and frustration, leads to an assessment of events as more stressful (Dich et al., 2015). Therefore, to assess the stress levels of an individual is not sufficient to dwell only on the objective value of the stressful event, but the subjective interpretation should be considered as well. On one hand, if the stressor is

perceived as positive, then it will be followed by a positive emotional response (joy, euphoria, enthusiasm, desire, impatience); on the other hand, if the stressor is perceived as negative, dangerous and deleterious to one's well-being, then it will be followed by a negative emotional response (fear, terror, anxiety, distress) (Grandi et al., 2011). The different type of emotional response also leads to different behavioral and biological reactions (Grandi et al., 2011). Higher levels of stress have emerged among adolescents (mean age= 18 years) who drink alcohol compared to peers who do not drink, and among binge drinkers compared to those who drink but not with this modality (Rafanelli et al., 2016). In a study of adults aged 25-74 years, stress, both acute episodes and chronic stress, was shown to be related to greater episodes of binge drinking (Grzywacz & Almeida, 2008). On days when people reported more stressors, compared to non-stressful days, there were also more binge drinking episodes (Grzywacz & Almeida, 2008). The relationship between binge drinking and stress is also mediated by level of education in two different ways, based on the type of stress: binge drinking in response to chronic stress is more common among those with lower levels of education, whereas binge drinking in response to acute stress is more common among those with college degrees compared to lower levels of education (Grzywacz & Almeida, 2008). Greater distress (poor attachment to school, presence of depressive symptoms) among 17/18-year-old students was correlated with greater use of alcohol and marijuana (Benner & Wang, 2015). Indeed, binge drinking may be used as a coping strategy to respond to distress (Oosterhoff et al., 2016). However, in an immigrant population in the United States, it was found that only those who had already experienced alcohol used binge drinking to reduce stress (Guilamo-Ramos et al., 2004). The relationship between stress and binge drinking was also mediated by the individual's coping strategies (Jaffee & D'Zurilla, 2009; Kuntsche et al., 2004). Stress may lead to increased alcohol use because the individual does not possess good coping skills (Sinha, 2001). Stressful events and conditions can impair emotional and behavioral development of adolescents, but they can also increase some adaptive skills by increasing resilience (Ellis et al., 2012). The body has a certain capacity for psychophysical adaptation to stressful situations (allostasis) that allows it to function effectively (Grandi et al., 2011) but under

certain circumstances, the individual will no longer be able to adapt and will experience organic deterioration (increased vulnerability to disease and more negative disease outcomes), referred to as allostatic overload (McEwen, 2000; Wexler Rainisch and Upchurch, 2013). In addition to physical illness, allostatic overload also leads to greater cognitive deficits and mortality (Dich et al., 2015). Two types of allostatic overload can be distinguished: one is characterized by those situations in which an allostatic response in excess of one's resources is required; another characterized by the accumulation of energy reserves that are, however, not used by the body (Grandi et al., 2011). Allostatic overload is measured by assessing physiological parameters that primarily relate to the functioning of hypothalamic-pituitary-adrenal axis (e.g., cortisol, adrenaline, noradrenaline, dehydroepiandrosterone) and immune system (e.g., interleukins, leukocytes, immunosuppression) (Grandi et al., 2011). An alternative way to assess the presence of allostatic overload is based on a clinimetric criteria classification devised by Fava and his colleagues (2010; 2017). This type of clinical assessment defines allostatic overload according to two criteria: criterion A concerns the presence of chronic stress or recent stressful events that exceed individual resources; criterion B involves the presence of one or more clinical manifestations that include psychiatric symptoms, psychosomatic symptoms, significant impairment of social and occupational functioning, and significant impairment of psychological well-being (Fava et al. 2010; 2017). Many studies have investigated the presence of allostatic overload and its effects on health, but there are few studies in adolescents (Dich et al., 2015; Goodman, 1999; Wexler Rainisch & Upchurch, 2013). One study involving U.S. adolescents aged 12-20 years found that males reported higher levels of allostatic overload than females, and differences by age also emerged with higher rates among 18–20-year-olds (38.6%), lower among 15-17-year-olds (31.8%), and intermediate among 12-14-year-olds (34.3%) (Theall et al., 2012). In another study with a representative population of U.S. adolescents (12-19 years old), it was found that levels of allostatic overload increase with age (Wexler Rainisch & Upchurch, 2013), as well as in a longitudinal study that measured allostatic overload in children as young as 9 years old and, at follow-up, at 17 years old (prevalence increased from 28% to 34%) (Dich

et al., 2015). What emerges from studies of adults is also confirmed: as environmental stressors increase; levels of allostatic overload also increase (Theall et al., 2012). Higher levels have been found in adolescents from families with lower socioeconomic status (Wexler Rainisch and Upchurch, 2013). In addition, higher levels of allostatic overload were reported in American 17-year-olds who are characterized by negative emotionality and low levels of self-regulation in childhood (Dich et al., 2015). Among adolescents with the highest levels of allostatic overload, binge drinking episodes emerged more frequently (Zimmermann et al., 2007). Excessive levels of stress and allostatic overload may therefore lead the individual to consume high amounts of alcohol to relax and relieve perceived stress, but the relationship may also be inverse and explain high levels of stress and allostatic load as a secondary consequence of high alcohol intake, mediated by the presence of various issues (family conflict, financial problems, legal problems, work difficulties, unwanted pregnancies, injuries, and accidents, etc.) (Zimmermann et al., 2007).

Problem-solving and coping strategies

Coping strategies encompass all the methods that an individual employs to deal with problematic situations that arise (Palmonari, 2011). They can be of various types depending on the characteristics of the problematic situation to be managed and the skills of the individual. Indeed, there are coping strategies oriented to the resolution of the problem that require mature skills, strategies oriented to the resolution of negative emotions and strategies of avoidance of the problem (such as drinking alcohol to reduce stress) that require less articulated skills (Sinha, 2001). The type of coping strategy that is chosen also depends on the perceived modifiability and controllability of the problem: situations reputed to be unmodifiable and uncontrollable often lead to the use of strategies focused on the resolution of negative emotions and avoidance strategies (Baiocco et al., 2008; Dobson, 2010). Females and males differ in their preferred coping strategies, in fact females use more emotion-centered coping strategies (they focus on regulating their emotions), whereas males are more likely

to adopt reward-oriented behavior (e.g., they use substances to self-medicate) and avoidance strategies (Baiocco et al., 2008; Wilkinson et al., 2016). The use of psychoactive substances, such as alcohol, can be a coping strategy to cope with severe stressful events or a chronic stressful situation, and generally to reduce negative emotions and increase positive emotions and well-being (Sinha, 2001). The negative reinforcement from using these substances to reduce distress and the positive reinforcement from perceived well-being can increase substance use (Sinha, 2001).

Problem solving is a specific coping strategy that allows for better resolution of problems and situations in general, leading the individual to respond adaptively (Jaffee & D'Zurilla, 2009; Dobson, 2010). Problem solving is characterized by the ability to identify what the problem is, look for different possible solutions, choose and implement the best solution, and check if it was effective or not (Dobson, 2010). When adolescents have to face a problem, their coping strategies are influenced by their emotions (Palmonari, 2011). In fact, they tend to adopt active strategies in the presence of positive emotions and strategies of avoidance and escape from the problem in the presence of negative emotions, such as using substances to avoid problems rather than face them (Palmonari, 2011). According to social problem-solving theory, problem-solving encompasses a set of skills and attitudes that begin to be learned at a very early age, but improve over the years as experience is accumulated in problem solving (Jaffee & D'Zurilla, 2003). In a study among parents and their children, it was found that parents' skills were significantly better than children's skills (Jaffee & D'Zurilla, 2003). Furthermore, problem solving is not a unitary construct but includes different types of approaches to the problem that can be classified as: positive problem orientation, negative problem orientation, rational problem-solving, impulsivity/carelessness style and avoidant style (Jaffee & D'Zurilla, 2003). Among adolescents with an average age of 17 years, the presence of negative problem-solving attitudes (negative orientation toward the problem; impulsive-superficial style and avoidant style), predicted the occurrence of externalizing behaviors, such as alcohol use, tobacco, drunk driving, more than the lack of positive skills (Jaffee & D'Zurilla, 2003). Specifically, impulsivity/carelessness style was related to alcohol, tobacco, marijuana, reckless driving, and drunk

driving use; negative problem orientation to marijuana use; and avoidant style to alcohol use (Jaffee & D'Zurilla, 2003). Therefore, the consumption of greater amounts of alcohol in adolescents would be influenced by the presence of a superficial and impulsive attitude in the face of problem solving or problem avoidance (Jaffee & D'Zurilla, 2003). Twenty-two percent of a sample of Italian adolescents (14-21 years old) reported drinking "to avoid thinking," making alcohol a coping strategy, specifically problem avoidance (Bartolini et al., 2013). Problematic alcohol use was correlated with worse problem-solving strategies in adolescents (Jaffee & D'Zurilla 2003; 2009). In addition, lower problem-solving skills emerged among female college students who engage in binge drinking (lower rational and reflective skills, poorer ability to identify the goal, devise several alternatives, choose one and evaluate the results, evaluate the consequences) compared to peers who do not drink with this modality (Dreer et al., 2004). Perceptions of one's problem-solving skills also impact alcohol use (Dreer et al., 2004). In fact, college students who believed they had good problem-solving skills reported less alcohol use (Dreer et al., 2004). Conversely, those with low confidence in their problem-solving skills used more alcohol to avoid responsibility and negative emotions associated with problems (Dreer et al., 2004).

Well-being

Over the years, it has emerged the importance of considering health and well-being not only as the absence of illness but also as the presence of subjective (hedonic) and psychological (eudaimonic) well-being (Eren & Kılıç; 2017; Grandi et al., 2011). Regarding to well-being, the hedonic approach considers subjective well-being in terms of pleasure attainment, pain avoidance, and life satisfaction (Kahneman et al., 1999), whereas the eudaimonic point of view concerns human positive functioning and self-realization in life (Ryan & Deci, 2001).

Adolescents who report using alcohol or other psychoactive substances at or before age 13 report the lowest levels of life satisfaction (Zullig et al., 2001). Life satisfaction is significantly lower in a sample of adolescents aged 12 to 15 years who are more involved in binge drinking episodes and use

more substances such as tobacco, cannabis, cocaine, and steroids (Zullig et al., 2001). An increase in binge drinking episodes following exposure to violence in adolescence (e.g., witnessing a shooting or stabbing, being involved in a fight resulting in serious injury) would lead to worse levels of adjustment in life, including lower life satisfaction and lower levels of physical health (Oosterhoff et al., 2016).

According to eudaimonic approach, Carol Ryff (1989) developed a multidimensional model of eudaimonic well-being to define psychological well-being. It does not embody happiness merely but represents the condition of human flourishing and 'the realization of one's true potential' (Ryff, 1995, p. 100). Indeed, this conceptualization refers to positive psychological functioning that is a close approximation of eudaimonic well-being (Lee & Carey, 2013). Ryff's model entails six dimensions of human functioning: self-acceptance; autonomy; positive relations; environmental mastery; personal growth; purpose in life (Ryff & Singer, 1996; 1998). Few studies on psychological well-being, as conceptualized by Carol Ryff, were conducted among adolescents (Kiang & Ip, 2017). Regarding the relationship between psychological well-being and binge drinking, previous research found specific impairments of PWB dimensions among Italian binge drinkers (Gostoli et al., 2021; Rafanelli et al., 2016). Specifically, young binge drinkers, in comparison with nondrinkers or those who drink but do not practice binge drinking, appear to have fewer goals and ambitions and to be more positively involved in relationships (Gostoli et al., 2021). The latter finding (association with positive relationships) seems counterintuitive but previous research showed that relationships in adolescence can also have a negative impact when the adolescent, out of a need to conform and be accepted by others, is influenced by the peer group to engage in risky behaviors (Courtney & Polich, 2009; Inguglia et al., 2019).

CHAPTER 3: PSYCHOLOGICAL WELL-BEING

Psychological well-being

Literature on positive aspects of human beings underlines the importance of considering mental health not only through the abatement of distress but also in restoring the positive and improving well-being (Eren & Kılıç; 2017; Ryff & Singer, 1996; Seligman & Csikszentmihalyi, 2000). Indeed, impairments in Psychological Well-Being (PWB) can represent vulnerabilities for both medical and psychiatric disturbances and influence the complex balance between positive and negative emotions (Ryff, 1989; Ryff & Singer, 1996). PWB is a state of optimal human experience, self-realization in life, and healthy psychological functioning (eudaimonic approach) (Ryan & Deci, 2001), and not only a condition of pleasure achievement, pain avoidance, and life satisfaction (hedonic approach) (Kahneman et al., 1999). In line with the eudaimonic perspective and Jahoda' s model (1958) of well-being, Carol Ryff (1989) developed theory-based indicators of PWB (i.e., environmental mastery, personal growth, purpose in life, autonomy, self-acceptance, and positive relations with others). Indeed, these dimensions (Ryff, 1989) were developed based on those described by Jahoda (1958): environmental mastery, development or self-actualization, autonomy, individual's degree of growth, self-perception/acceptance, satisfactory interactions with other people, and the individual's balance and integration of psychic forces. Concerning PWB conceptualization, Ryff and Singer (2008) emphasized the importance to seek a balance avoiding excess to achieve an optimal human functioning. In line with this conceptualization, people may exhibit different levels (high, balanced, low) in PWB dimensions (Fava & Ruini, 2014).

Environmental Mastery

> High level: The person is unable to savor positive emotions and hedonic pleasure. He/she is unable to relax.

Balanced-functioning level: The person has a sense of mastery and competence in managing environment; controls external activities; makes effective use of surrounding opportunities; able to create/choose contexts suitable to own needs.

Low level: The person has difficulties in managing everyday affairs; feels unable to change/ improve surrounding context; is unaware of surrounding opportunities; lacks sense of control over external world.

Personal Growth

High level: The person is unable to process negativity, forgets or does not give enough emphasis to past negative experiences, cultivates benign illusions that do not fit with reality, sets unrealistic standards for overcoming adversities.

Balanced-functioning level: The person has a feeling of continued development; sees self as growing and expanding; is open to new experiences; has sense of realizing own potential; sees improvement in self and behavior over time.

Low level: The person has a sense of personal stagnation; lacks sense of improvement or expansion over time; feels bored and uninterested with life; feels unable to develop new attitudes or behaviors.

Purpose in life

High level: The person has obsessional passions, is unable to admit failures. He/she manifests persistence and rigidity and is unable to change perspective and goals. Excessive hope is paralyzing and hampers facing negativity and failures.

Balanced-functioning level: The person has goals in life and a sense of directedness; feels there is meaning to present and past life; holds beliefs that give life purpose; has aims and objectives for living.

Low level: The person lacks a sense of meaning in life; has few goals, lacks sense of direction, does not see purpose in past life; has no outlooks or beliefs that give life meaning.

Autonomy

High level: The person is unable to get along with other people, to work in team, to learn from others. He/she spends time and energy for fighting for his/her opinions and rights. Relies only on himself/herself for solving problems and is unable to ask for advice/help.

Balanced-functioning level: The person is self-determining and independent; able to resist to social pressures; regulates behavior from within; evaluates self by personal standards.

Low level: The person is overconcerned with the expectations and evaluation of others; relies on judgment of others to make important decisions; conforms to social pressures to think/act in certain ways.

Self-acceptance

High level: Narcissism, egocentrism, difficulties in admitting owns mistakes, rigidity.

Balanced-functioning level: The person has a positive attitude toward the self; accepts his/her good and bad qualities; feels positive about past life.

Low level: The person feels dissatisfied with self; is disappointed with what has occurred in past life; wishes to be different than what he/she is.

Positive relations

High level: Due to exaggerated empathy, the person feels pain and distress of others. His/her generosity and altruism have a cost in terms of allostatic load. He/she sacrifices his/her needs and well-being for those of others.

Balanced-functioning level: The person has warm and trusting relationships with others; is concerned about the welfare of others; capable of strong empathy affection, and intimacy; understands give and take of human relationships.

Low level: The person has few close, trusting relationships with others; finds difficult to be open and is isolated and frustrated in interpersonal relationship; not willing to make compromises to sustain important ties with others.

Not only can low levels of PWB dimensions be detrimental, but also high level. For example, people who strongly want to achieve a goal or purpose in life over all obstacles and difficulties can become so obsessed that their lives revolve around achieving the goal (Vallerand et al., 2007). Personal relationships and activities outside of this are not considered, leading to a psychological inflexibility and a cost in terms of stress and allostatic overload that is detrimental to well-being (Kashdan & Rottenberg, 2010). On the other hand, those who show good levels of purpose and relationships with others may be more likely to adopt health -promoting behaviors (Ryff & Singer, 1998). Indeed, Ryff and Singer (1998, p.22), suggest "It is thus attention to the broader context of people's lives and their encounters with core life goods that may illuminate underlying reasons for practicing, or failing to practice, positive health behaviors". A large longitudinal study, the HRS (Health and Retirement Study), found that people with a higher sense of purpose in life had a lower risk of stroke and myocardial infarction among those with coronary heart disease (Kim et al., 2013a; 2013b). In the same study, people with higher levels of purposeful engagement were more likely to engage in preventative health behaviors including cancer screenings and cholesterol tests than their age counterparts with lower levels of purposeful engagement (Kim et al., 2014). Another big longitudinal study, MIDUS (Midlife in the United States), found that having a sense of purpose in life lowers the risk of mortality throughout adulthood (Hill & Turiano, 2014).

Previous research showed that specific impairments of PWB dimensions were associated with binge drinking among Italian adolescents (Gostoli et al., 2021; Rafanelli et al., 2016). Specifically, young

binge drinkers, in comparison with nondrinkers or those who drink but do not practice binge drinking, appear to have fewer goals and ambitions and to be more positively involved in relationships (Gostoli et al., 2021). The latter finding (association with positive relationships) seems counterintuitive but previous research showed that relationships in adolescence can also have a negative impact when the adolescent, out of a need to conform and be accepted by others, is influenced by the peer group to engage in risky behaviors (Courtney & Polich, 2009; Inguglia et al., 2019).

Well-Being Therapy

Well-Being Therapy (Fava, 1999; 2016) is a short-term psychotherapy with the aim to improve psychological well-being at a balance level, achieving a state of euthymia (Fava & Bech, 2016; Fava & Guidi, 2020; Guidi & Fava, 2021), in line with Jahoda's concept of flexibility (1958) and Ryff's model (1989) of psychological well-being. Flexibility was defined as an individual's psychic force balance (flexibility) characterized by a unifying view on life that directs emotions and behaviors, and stress resistance (Fava, 2016; Jahoda, 1958). It is the individual's ability to adapt to changing needs and not simply avoiding excesses and extremes (Fava, 2016; Jahoda, 1958).

Well-Being Therapy lasts 8–12 sessions and can occur weekly or every other week. Each session can last between 30 to 50 minutes. The use of a structured diary during the therapy emphasizes the importance of self-observation (Emmelkamp, 1974). Another important feature is self-therapy, sustained by specific homework (Fava, 1999; 2016; Guidi et al., 2018; Ruini & Fava, 2012). In the first sessions of therapy, the person is asked to identify moments of well-being in daily life and to report them in the diary indicating the level of well-being on a scale from 0 to 100 (Fava, 1999; 2016; Guidi et al., 2018; Ruini & Fava, 2012). Patients were also asked to recognize optimal experiences described situations in which they feel to have control, environmental mastery, involvement, concentration, clear feedback, enjoyment, and intrinsic motivation (Csikszentmihalyi, 1990; Deci & Ryan, 1985). In subsequent sessions, patients are asked to identify thoughts and situations that interrupt moments of well-being, indicating them in the diary (Fava, 1999; 2016; Guidi et al., 2018;

Ruini & Fava, 2012). This technique is similar to the automatic thoughts of cognitive therapy (Beck et al., 1979) and irrational thoughts of Ellis and Becker's rational-emotive therapy (1982) but the focus is on well-being and not distress. The therapist helps patients find and modify these negative and irrational thoughts with more adaptive and rational ones and entices patients to expose them to situations that might enhance their well-being (Fava, 1999; 2016; Guidi et al., 2018; Ruini & Fava, 2012). During the therapy, PWB dimensions are progressively presented to the patients, in line with the deficiencies registered in the diary and reported during the sessions (Fava, 1999; 2016; Guidi et al., 2018; Ruini & Fava, 2012).

Well-being therapy (Fava, 1999; 2016; Fava & Ruini, 2003; Fava & Tomba, 2009) arose in a therapeutic context as a result of a growing realization that typical therapies for affective disorders were insufficient in determining full recovery. Indeed, first studies were conducted to reduce residual symptomatology (e.g., irritability, anxiety) of patients who were assessed to be remitted according to the Diagnostic and Statistical Manual of Mental Disorders (DSM, American Psychiatric Association, 2013). Indeed, Well-Being Therapy showed its effectiveness in the residual phase of affective disorders (Fava et al., 1998a). Additionally, subsequent developments broaden the use of WBT with other clinical populations such as patients with recurrent depression (Fava et al., 1998b), cyclothymic disorder (Fava et al., 2011; Tomba et al., 2016), depression and/or demoralization in patients with acute coronary syndrome (Rafanelli et al., 2020), depression in infertile women (Moeenizadeh & Zarif, 2017), anxiety disorders (D'Ambrosio & D'Ambrosio, 2021; Fava et al., 2005), post-traumatic stress disorder (Belaise et al., 2005), mental illness in forensic patients (Ferguson et al., 2009). Well-Being Therapy has also showed its effectiveness in the treatment of other disorders in single cases, as a patient with migraine and depressive symptoms (Mansueto & Cosci, 2021), or a patient with anorexia nervosa (Tomba & Tecuta, 2016). Preliminary results showed its effectiveness also in reducing symptoms (particularly anxiety and somatization) and improving psychological well-being in four children with different psychiatric diagnoses (Albieri et al., 2009). Two of them also showed improvements in school performance (Albieri et al., 2009).

Over the years, Well-Being Therapy was implemented also in non-clinical population, such as university, high-school, and middle-school students (Eduviere et al., 2021; Ruini et al., 2006; 2009; Tomba et al., 2010; Xu et al., 2019), athletes (Thompson & Schary, 2021), older adults (D'Ambrosio & D'Ambrosio, 2021; Friedman et al., 2017; 2019) showing interesting results. Regarding to the implementation of the Well-Being Therapy in the Italian school setting, Ruini and colleagues (2006) were the first to adapt it for the school setting. A sample of 111 middle school students (mean age = 13.04; SD = 0.76) was randomly assigned to either a protocol based on Cognitive Behavioral Therapy, or a protocol based on Well-Being Therapy. In both groups four two-hour sessions were implemented once a week. Students showed improvements in symptoms and PWB in a similar way after both interventions (Ruini et al., 2006). Specifically, Well-Being Therapy protocol was associated with a significant decrease in hostility (measured with Symptom Questionnaire; Kellner, 1987) and increase in self-acceptance (measured with Psychological Well-Being Scales; Ryff, 1989). Moreover, when compared to Cognitive Behavioral Therapy group, Well-Being Therapy resulted in a significant improvement in physical well-being (measured with Symptom Questionnaire; Kellner, 1987). In a subsequent study, the Well-Being Therapy protocol was compared to the anxiety management protocol in a sample of 162 middle school students (mean age = 11.41 years; SD = 0.56) (Tomba et al., 2010). Six two-hour sessions once a week were conducted in both groups. Well-Being Therapy showed significant improvements in autonomy (measured with Psychological Well-Being Scales; Ryff, 1989) and friendliness (measured with Symptom Questionnaire; Kellner, 1987) and reduction in physiological anxiety (measured with the Revised Children's Manifest Anxiety Scale), whereas anxiety-management protocol ameliorated anxiety only. Ruini and colleagues (2009) implemented an intervention based on Well-Being Therapy among 227 high school students (mean age = 14.47 years; SD = 7.69) in comparison with an attention placebo protocol. Students who followed the Well-Being Therapy protocol showed higher improvement in psychological well-being (i.e., personal growth) compared with the other group; and significant reduction in distress (i.e., anxiety and somatization).

These preliminary results showed the feasibility of a protocol based on Well-Being Therapy adapted to the school setting for improving PWB and reducing psychological symptoms of children and adolescents (distress, somatization, anxiety, physiological anxiety) (Ruini et al., 2006, 2009; Tomba et al., 2010). However, it has never been applied to prevent alcohol use and binge drinking among young Italian adolescents. This study has the aim to fill this gap in literature about positive psychology interventions, implementing an intervention based on WBT to reduce and prevent alcohol use and binge drinking in the school setting. Previous research emphasized the importance of carrying out preventive interventions within the school environment to reach a considerable number of subjects, reduce the stigma associated with mental health services (when mental health professionals are involved), increase the accessibility to early and effective interventions and improve social and emotional climate (Strøm et al., 2014; Tomba et al., 2010).

SECOND PART. THE EXPERIMENTAL STUDY

CHAPTER 4: METHOD

Aims and hypotheses

The purpose of this three-arm cluster randomized controlled trial (RCT) was to test the efficacy of a psychological intervention at school (Well-Being Intervention, WBI), based on WBT principles (Fava, 2016) to prevent or stem alcohol use, binge drinking and other unhealthy lifestyle behaviors (first outcome) at its early onset, to improve problem-solving abilities (second outcome) and to reduce psychological distress (third outcome). The aims of the study are in line with the United Nations Sustainable Development Goals and recommendations of the WHO Accelerated Action for the Health of Adolescents (AA-HA!) guidance (WHO, 2017).

Since different results emerge when an intervention is compared with an active intervention or a nonactive group (Carr et al., 2020), it was decided to consider both comparisons in this study. Indeed, the WBI was compared with an intervention based on the implementation of the knowledge about health and lifestyle (Lifestyle Intervention – LI) and a condition without interventions (No Intervention – NI).

The first hypothesis is that the prevalence of alcohol use and binge drinking would be less in the WBI group and LI group than NI at the end of the intervention and up to 6-month follow-up. Indeed, since previous studies found that impairments in PWB dimensions were risk factors associated with binge drinking (Gostoli et al., 2021; Rafanelli et al., 2016), improving PWB with an intervention based on WBT could play a protective role against these risky behaviors. Likewise, given that LI has the aim to improve the knowledge on alcohol and its expectancies, it would prevent or reduce alcohol use and binge drinking.

The second hypothesis is that WBI would lead to a greater improvement in lifestyle, in comparison with NI, in line with the evidence that PWB dimensions (except autonomy) predicted fewer problems on sleep (Phelan et al., 2010) and purpose in life was associated with an increased likelihood of

enacting preventive behaviors (Kim et al., 2014). The LI would improve lifestyle, in comparison with NI, enhancing the knowledge about positive aspects of a healthy lifestyle.

The third hypothesis is that the WBI, with a focus on the improvement of problem-solving abilities (in particular, during the activities on environmental mastery dimension), would show higher scores in problem-solving abilities than LI and NI.

Considering that previous research showed that an intervention based on WBT is effective in reducing psychological distress (i.e., anxiety, hostility, somatization) among Italian students (Ruini et al., 2006, 2009; Tomba et al., 2010), the fourth hypothesis is that the WBI would bring to lower scores in psychological distress than LI and NI, both at the end of the intervention and follow-ups.

Participants

Students have been included in the study if: a) were part of casually selected schools; b) attended the first year of high school; c) had the informed consent, signed by parents or guardians; d) gave their informed assent for participation in the study. Those who did not meet the inclusion criteria were not enrolled in the study. Accordingly, participants in the current study resulted in two hundred and seven students (88 in WBI; 75 in LI; 44 in NI) of which 60.4% females, 36.7% males, 2.9% did not answer the question and with a median age of 14 (IQR = 0).

Design

This was a three-arm, school-based, cluster RCT including three test periods (pre-test, post-test, and 6-month). First-year high school students were enrolled during 2018-2019 in Ferrara (North-East of Italy). Three schools were randomly selected from all high schools in Ferrara with the random number generator and invited via email through publicly available contact details. Once school directors showed their interest in the project, more information was shared with school directors and teachers. After they consented to start the study, all the first-year classes (n=11) of the selected schools were

enrolled to receive either WBI (five classes), LI (four classes) or to not receive any interventions (two classes). Each student received one alphanumerical code to put in every questionnaire administration to ensure anonymity. All the eligible students underwent the assessment at baseline (T0). Six 2-hour meetings were held both in the WBI group and LI group. At the end of the sessions (after 3 months) (T1), and after 6 months (T2), the same questionnaire was re-administered in all the classes to evaluate the effectiveness of the interventions in the short and medium term. *Figure 1* illustrates the flowchart of the study in line with Intention to Treat (ITT) principle.

Randomization, using a computerized random number generator, was directed at the class level and within schools to limit biased differences due to school characteristics. It was conducted by a collaborator who did not participate in the assessments and who had no contact with schools, classes, or students. The classes were randomly assigned to three groups: WBI, LI and NI. While parents, students and teachers were blinded to the group assignment (WBI and LI, but not NI), the practitioner was well-informed about the experimental protocol.

The Ethics Committee of the Department of Psychology and the Bioethics Committee of the University of Bologna provided ethical approval for this cluster-randomized controlled trial (Prot. n. 0072226).

Interventions

The interventions (i.e., WBI and LI) were conducted in the classroom during school hours. They both consisted of 6, 2-h sessions, held every 10-15 days. The sessions were performed by a clinical psychologist, previously trained in Well-Being Therapy (WBT). Moreover, two expert psychotherapists provided supervision for the meetings. During the meetings, in both groups brainstorming, group discussions, games, role-playings, and watching videos were used. Both interventions included a discussion about alcohol in order to enhance the capacity to refuse it in the

WBI group or to promote the knowledge about the positive effects of not using it in the LI group. Sessions are presented in detail below.

Well-Being Intervention (WBI)

WBI was based on WBT principles (Fava, 2016) and protocols previously implemented among Italian students (Ruini et al., 2006, 2009), showing its feasibility. A manualized protocol of WBI was prepared to guarantee integrity and fidelity when performing the intervention in different classes. On the other hand, the amount of time dedicated to each topic could vary based on student needs. The specific elements of this intervention, according to WBT, were self-monitoring of episodes of well-being; identification of automatic thoughts leading to interruption of well-being; discussion and modification of dysfunctional beliefs according to Ryff's PWB dimensions (1989). The PWB dimensions were presented highlighting how a balanced level within the dimensions was adapting. Specific activities were performed to improve a balanced level within the dimensions. During this intervention, students were trained to self-observation in a diary.

Session 1.

Get to know each other and underline the importance to have a confidential, non-judgmental, and respectful attitude.

Topic: emotions. Students are taught to recognize different emotions from facial expressions and non-verbal behavior and communicate different types of emotions through role-playing. For instance, the class is divided into two groups; each group has to recognize the emotions expressed by their classmates and try to understand the situation that led to that specific emotion; the winner is whoever guessed emotions and situations.

Homework: record emotions in daily situations in a diary.

Session 2.

Topic: the relationship between emotions and thoughts. From the situations reported, students are taught to recognize the influence that the interpretation of a situation (thought) has on the emotion felt (e.g., a schoolmate answers badly to me; thought: he does not like me; emotion: sadness). Students are taught to recognize cognitive errors and correct them with alternative, more positive interpretations (e.g., a schoolmate answers badly to me; alternative thought: he is angry because he got a bad grade; emotion: altruism).

Homework: add 'interpretation' (immediate interpretation of a situation) and 'alternative thinking' (more positive interpretation) columns to the diary.

Session 3.

Topic: well-being. Students are asked to give their definition of well-being and to share well-being situations experienced in daily life. Ryff's model of psychological well-being is presented. The first dimension explored is 'environmental mastery'. The exercises conducted in this session are intended to increase problem-solving and environmental management skills. For example, students are asked to write down a problem anonymously, the psychologist read the problem, all the students try to use problem-solving skills to solve it.

Homework: record the circumstances surrounding the episodes of well-being and their intensity (from 0 'absence of well-being' to 100 'the most intense feeling of well-being that can be experienced') in a new diary.

Session 4.

Topic: well-being. Students are taught to recognize thoughts that interrupt well-being episodes (e.g., I am happy to have gotten a good grade; thought that interrupts well-being: it was just luck!). Two dimensions of well-being are explored: 'personal growth' and 'purpose in life'. Students are taught to be aware of their improvement in life and to know how to set realistic goals to achieve. In one of the exercises, each classmate says and receives a compliment. This allows reflection on one's self-awareness.

Homework: add the column 'thoughts that interrupt well-being' in the diary.

Session 5.

Topic: well-being. Students are taught to discuss and modify dysfunctional beliefs. The addressed dimensions of well-being are ‘self-acceptance’ and ‘autonomy’. Improving self-acceptance begins with improving self-awareness. Students are asked to individually answer to the questions ‘How do I see myself? What are my positive and negative qualities? How do others see me?’ and then discuss them as a group. During this session, the influence that ‘perfect’ social network images have on self-acceptance is discussed. Regarding autonomy, students are helped to be aware of their inability to ask for help (high autonomy) or the influence that others have on their thoughts and behaviours (low autonomy). Among the exercises, one asks to tell an episode in which the student or a friend of the student did something he/she did not want to do (e.g., smoke or drink alcohol) only because he/she was influenced by his/her friends. Strategies to improve autonomy are discussed.

Homework: add the column ‘another point of view on the situation’ in the diary.

Session 6.

Topic: well-being. Students are taught to think about an alternative viewpoint to the interpretation that interrupts well-being. The dimension of well-being in this session is ‘positive relationships’. Students share beliefs and difficulties about relationships with classmates. Strategies to improve relationships are discussed. It is concluded by reflecting on the sessions held. The importance of continuing efforts to maintain and increase well-being is emphasized.

Lifestyle Intervention (LI)

The intervention implemented in the LI group was based on lifestyle psychoeducation. All the sessions were addressed to boost knowledge about positive aspects of implementing healthy behaviors and the first part of every session was dedicated to the resolution of conflicts in the class. The first session was focused on the concept of health. In the second and third sessions benefits of not being “addicted” were discussed, specifically on the use of alcohol, tobacco, and cannabis. The

fourth and fifth sessions were based on health nutrition. The sixth session was based on sport and the benefits of physical activity. The last session concluded with a brief review of all the concepts with a final competition based on questions about healthy lifestyle discussed in the previous sessions.

Session 1.

Get to know each other and underline the importance to have a confidential, non-judgmental, and respectful attitude.

Topic: health. Students are asked to say what health and 'being healthy' mean to them. The World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being and not simply the absence of disease' is presented. The importance of this definition is discussed. Healthy and unhealthy lifestyle is introduced through a team game in which each team must list as many behaviors as possible and then rank them as healthy or unhealthy.

Sessions 2 and 3.

Topic: life without addiction. The main aim is to discuss the benefits of not being addicted. Students' opinions are listened to and stimulated. False myths are debunked (e.g., alcohol quenches thirst, wine warms the body, spirit helps digestion, a few cigarettes a day do not harm, etc.). It is explained what happens to the body and the mind when certain behaviors are carried out.

The image of the 'not be addicted' is enhanced, avoiding negative communications as much as possible. For instance, non-smoking is presented as a desirable attribute, brilliant, enviable, highlighting the positive aspects: maintaining physical fitness, better sports performance, aesthetic factors (beauty, healthy appearance and fresh), personal hygiene and healthy lifestyle, freedom (as opposed to the dependence of the smoker), respect for others (family members, children, travel companions), ecological factors (fresh air, clean environment, pollution), economic factors (saving money).

The positive aspects and benefits of not starting and quitting smoking, drinking alcohol, using cannabis are presented.

Sessions 4 and 5.

During these sessions, students' knowledge and beliefs about healthy eating are investigated: What is it? Where do their beliefs come from? What do doctors tell us? What do newspapers and mass media tell us?

After group discussion, a single concept of ‘healthy eating’ is outlined based on the latest WHO and Ministry of Health guidelines, explaining the nutrients needed by our bodies for a balanced and preventive diet.

Fundamental concepts such as caloric intake, the Mediterranean diet, the food pyramid, macronutrients, and micronutrients are explained. One exercise is to create their food pyramid and compare it with the healthy one. Students are asked to describe their diet by giving examples of what they have eaten in the previous days. Healthy habits are analyzed in groups and emphasized.

Messages from advertising and mass media, food labels, seasonality of foods, and emotional and relational meanings linked to food are analyzed together.

Session 6.

The focus is on the benefits of practicing sports and physical activity. Students' knowledge of the benefits of sport, the motivations that lead them to practice it, their positive experiences related to sport are investigated. Some student volunteers tell others their positive stories about sports. Different activities to be active are presented (e.g., choose the stairs instead of the elevator; get off at an earlier bus stop). The intervention concludes with a game in which the class is divided into four teams that must answer a quiz on the topics covered in previous sessions. The two teams that score the most points receive a symbolic prize.

Assessment

A self-report questionnaire, including questions on sociodemographic data (e.g., age, gender), lifestyle (e.g., physical activity, diet, sleep, internet, and substance use), and psychological characteristics, was administered at baseline and follow-ups. Sociodemographic information included

ad-hoc questions about age; gender; types of high school attended; grade point average; parents' job and education level; perceived household income (i.e., 'How do you view your family's economic situation compared to other families?' with three response options 'worse', 'identical', 'better'); immigration and ethnicity. Ad-hoc questions assessed physical activity (i.e., at least 60 minutes per day), in line with guideline of World Health Organization (WHO, 2020a); playing sports (i.e., the type of sport, frequency, competition); fruit and vegetable consumption, healthy family diet, hours of sleep during school time; use of technological devices (i.e., TV, smartphone, computer, video game consoles); the urgency to use them; their negative impact on performance (e.g., performing poorly on homework because you are using your smartphone). To investigate internet addiction, six questions were taken from the Internet Addiction Test (IAT; Fioravanti & Casale, 2015; Young, 1998).

To evaluate alcohol consumption and binge drinking, Alcohol Use Disorder Identification Test- C (AUDIT-C) has been used (Bush et al., 1998; Rumpf et al., 2013; Saunders et al., 1993). AUDIT-C showed its effectiveness in screening adolescents for at-risk alcohol use, binge drinking, and alcohol abuse (Coulton et al., 2019; Liskola et al., 2018). The optimum cut-off point of the AUDIT-C in identifying at-risk drinking in adolescents is ≥ 3 (Coulton et al., 2019; Deluca et al., 2020; Liskola et al., 2018). AUDIT-C consists of three items with answers on a 5-point Likert scale. Questions are scored from 0 to 4, which allows for a maximum sum score of 12. The third item ('How often do you have six or more drinks on one occasion?') has been modified in 'How often do you have five or more drinks on one occasion?' (never; less than monthly; monthly; weekly; daily or almost daily) to establish the presence of binge drinking, as defined by ESPAD reports criteria [i.e., 'How many times (if any) have you had five or more drinks in a row? A drink is a glass of wine (approximately 15 centiliters), a bottle or can of beer (approximately 50 centiliters), a shot glass of spirits (approximately 5 centiliters) or a mixed drink.'] (ESPAD, 2015). The cut-off of 5 or more drinks brings a person's blood alcohol concentration to 0.08 grams percent or above and this is chosen because of its functional impact on the drinker (Fillmore & Jude, 2011). If the participant gave an answer from monthly to

daily or almost daily, then he/she was classified as a binge drinker. To assess cannabis consumption, items from the Cannabis Experience Questionnaire (Di Forti et al., 2009) have been selected.

Psychological Well-Being Scales (PWBS) (Ryff & Singer, 1996), short version (18 items) (Sirigatti et al., 2013) were used to assess Psychological Well-Being (PWB). Validated among Italians (Ruini et al., 2003), it has been used in different studies with similar samples revealing test-retest reliability (Ruini et al., 2006, 2009). PWBS assess six areas of PWB according to Ryff conceptualization (1989): autonomy (to live in accord with own personal convictions), environmental mastery (competence in managing environmental and life situations), personal growth (continuous personal development), positive relations (satisfying high-quality relationships), purpose in life (a belief that life has meaning and purpose), and self-acceptance (a positive view of self and past life). Answers were given on a 6-point Likert scale. Higher the scores, the higher the levels of PWB. Internal consistency among the Italian youth population ranged from $\alpha = 0.55$ to $\alpha = 0.87$ (Casale et al., 2015; Gigantesco et al., 2011; Liga et al., 2020).

Problem Solving Inventory – Italian Adolescents (PSI-IT) (Heppner, 1998; Nota et al., 2013) was used to measure individual perception of problem-solving abilities. It consists of 35 items on a 6-point Likert scale (from 1 = 'strongly agree' to 6 = 'strongly disagree'). Higher scores correspond to higher self-evaluated problem-solving abilities. PSI-IT is divided into three factors: Problem Solving Engagement (PSE; i.e., the tendency of engaging or approaching problems), Self-Assurance (SA; i.e., tendency to feel efficacious in solving problems), and Methodical Thinking (MT; i.e., ability to systematically think in problem resolution). Internal consistency estimates of the three factors (i.e., PSE, SA, MT) and the total score were 0.83; 0.77; 0.69; 0.85, respectively (Nota et al., 2013).

Symptom Questionnaire (SQ) (Benasi et al., 2020; Kellner, 1987), a 92-item self-rating scale with dichotomous responses was used to evaluate psychological subclinical distress (i.e., anxiety, depression, somatization, and hostility-anger). Higher scores indicate higher psychological distress in the related scale. SQ showed Cronbach α coefficients ranged from 0.74 (hostility scale) to 0.34 (somatization scale) (Vescovelli et al., 2014).

PsychoSocial Index (Piolanti et al., 2016; Sonino & Fava, 1998), a 53-item self-rating questionnaire, was employed to investigate the presence of stressful events and allostatic overload. Participants have to answer on a dichotomous scale (Yes/No) to some items and on a Likert scale to others (from 0 = 'not at all' to 3 = 'a great deal'). The operationalization of allostatic overload is based on specific clinimetric criteria developed by Fava and his colleagues (Fava et al., 2010, 2017). Criterion A requires the presence of an identifiable stressor that must be judged as exceeding or taxing the individual's coping skills. Criterion B requires the stressor to be associated with at least one manifestation among psychiatric or psychosomatic symptoms, impaired functioning, or compromised well-being. The PsychoSocial Index showed intraclass correlation coefficients ranging from 0.94 to 0.80 (Sonino & Fava, 1998).

Statistical analyses

Baseline characteristics (i.e., sociodemographic, lifestyle, and psychological) for each treatment group were presented, with categorical variables reported as percentages, and continuous variables as mean and SD for normally distributed variables or median and interquartile range for non-normally distributed variables (*Tables 1* and *2*). Outcomes were analyzed according to the intention-to-treat (ITT) (Gupta, 2011; McCoy, 2017) principle using linear mixed models for continuous outcomes and generalized linear mixed models for binary outcomes. Because mixed models allow analysis of all available data with acceptable bias under a missing at random assumption, no imputation method was used for missing data. All models included fixed effects for treatment group, time (treated as categorical), and group-by-time interactions for the primary treatment effects and school, sex, and socioeconomic status as covariates for adjustment. Random effects were included to account for clustering at the student and class level using a random intercept. Cohen's d was calculated to determine standardized effect sizes for changes over time between and within each group (*Table 3*), using Cohen's conventions for magnitude (Cohen, 1992): 0.2 = small; 0.5 = moderate; and ≥ 0.8 =

large. Continuous results were reported as adjusted difference in change (*Table 4*) and binary results as adjusted odds ratio (AOR) (*Table 5*). All alpha levels were set at $p < .05$. Analyses were performed with R (version 4.1.1, The R Foundation for Statistical Computing, Vienna, Austria), using the packages *lme4* and *lmerTest* for fitting linear and generalized linear mixed models, *emmeans* for estimated marginal means and predictions, and *ggplot2* for statistical graphs.

CHAPTER 5: RESULTS

Description of the sample

Baseline characteristics of the sample, differentiated by group, can be seen in *Tables 1* (i.e., sociodemographic and lifestyle characteristics) and *2* (i.e., psychological variables). Eighty-eight (F=60%; median age=14, IQR=0), seventy-five (F=61.1%; median age=14, IQR=1) and forty-four (F=68.2%; median age=14, IQR=0) students were in the WBI, LI or NI, respectively. There were no significant differences between groups except for the type of school attended with a majority of students attending high school in the WBI (50%) and NI (100%) group in comparison with the LI group (30.7%) (*Table 1*).

Primary outcomes

Alcohol use and binge drinking

Regarding the linear mixed model, the interaction intervention by group was statistically significant for the AUDIT-C total score for WBI (p = 0.008) and LI (p = 0.003) in comparison with NI from baseline to 6-month follow-up. AUDIT-C total score increased less in WBI (Estimate = -0.806) and LI (Estimate = -0.956) in comparison with NI considering changes from baseline to 6-month follow-up (*Table* 4).

Considering binary variables (i.e., binge drinking, at-risk drinking), the main results from mixed-effects logistic regression are presented below and in *Table 5,* for a more detailed view. The odds to be classified as binge drinkers in WBI in comparison with NI from baseline to post-test (OR 0.39; 95%CI 0.01–12.22) and from baseline to 6-month follow-up (OR 0.64; 95%CI 0.02–16.87) were not statistically different. The odds to be classified as binge drinkers in LI in comparison with NI from baseline to post-test (OR 0.63; 95%CI 0.02–22.26) and from baseline to 6-month follow-up (OR 0.18;

95%CI 0.01–6.79) were not statistically different. The odds to be classified as at-risk drinker in WBI (OR 4.44; 95%CI 0.13–152.1) and LI (OR 2.95; 95%CI 0.06–135.9) were not statistically different from NI at post-test in comparison with baseline. Otherwise, at 6-month follow-up, both WBI (OR 0.01; 95%CI 0.01–0.14) and LI (OR 0.01; 95%CI 0.01–0.03) reduced the odds to be classified as at-risk drinker in comparison with NI.

Lifestyle (Tobacco, E-cigarettes, Cannabis, Sport, Diet, Sleep, Internet use)

Mixed-effects logistic regression for binary outcomes (i.e., tobacco smoking, e-cigarettes use, cannabis use, physical activity, sport, and healthy diet) did not show significantly differences between groups, except for e-cigarettes use and cannabis use (*Table 5*). The odds to use e-cigarettes were less in WBI (OR 0.01; 95%CI 0.01–0.35) than NI from baseline to 6-month follow-up ($p = 0.01$). The odds to use cannabis were less in WBI (OR 0.01; 95%CI 0.01–0.18) than NI from baseline to post-test ($p = 0.01$).

Linear mixed models showed that sleep hours at night decreased more in NI than in WBI (Estimate = 0.57, $p = 0.029$) and LI (Estimate = 0.764, $p = 0.006$) from baseline to 6-month follow-up (*Table 4*). Internet addiction scores decreased in WBI (Estimate = -0.933, $p = 0.003$) and LI (Estimate = -0.686, $p = 0.004$) from baseline to post-test in comparison with NI (*Table 4*).

Secondary outcomes

Problem-solving abilities

Linear mixed models did not show significantly differences in problem-solving abilities, apart from the subdimension Methodical Thinking that increased more in WBI (Estimate = 2.228, $p = 0.05$) and LI (Estimate = 2.504, $p = 0.04$) than in NI from baseline to 6-month follow-up (*Table 4*).

Psychological distress

Regarding psychological distress, linear mixed model did not show an effect of the intervention on anxiety, somatization, and hostility (*Table 4*). On the contrary, the increase in depression was less in WBI (Estimate = -2.578, $p = 0.03$) and LI (Estimate = -2.842, $p = 0.03$) in comparison with NI at 6-month follow-up (*Table 4*).

Mixed-effects logistic regression showed that the odds to be classified positive for allostatic overload was less in LI in comparison with NI from baseline to 6-month follow-up (OR 0.16; 95%CI 0.03–0.84; $p = 0.03$), and in comparison with WBI from baseline to post-test (OR 0.04; 95%CI 0.01–0.43; $p = 0.008$) and to 6-month follow-up (OR 0.14; 95%CI 0.03–0.58; $p = 0.007$) (*Table 5*).

CHAPTER 6: DISCUSSION

At the best of our knowledge, this is the first study that evaluated the effectiveness of an intervention based on WBT to reduce or prevent alcohol use and binge drinking in adolescence, through the promotion of a balanced functioning (Guidi & Fava, 2021) in line with Jahoda's model (1958). Prevention of underage alcohol use is one of the most important aims to achieve in order to reduce risks for health and development at this age (Regan et al., 2020). Indeed, the earlier is the age to start consuming alcohol, the worse the psychosocial consequences, including alcohol dependence later in life (Regan et al., 2020).

The hypotheses of this study were partially confirmed. Regarding alcohol use, both the interventions (WBI and LI) showed a protective effect, in comparison with NI, on the total score of the AUDIT-C and on the odds to be classified as at-risk drinker. Considering that during adolescence, alcohol use tends to increase (Brown et al., 2008; Schuler et al., 2015), both the intervention based on the improvement of PWB (WBI) and the intervention based on the increase of health knowledge (LI) had a positive effect in comparison of the usual activities in class (NI). On one hand, as hypothesized, working on the achievement of a better balance within PWB dimensions was protective for the increase of alcohol use and risky alcohol use at this age. On the other hand, WBI and LI did not show an effect on binge drinking. This lack of effect on binge drinking could be explained by the difficulty to measure this phenomenon (Lannoy et al., 2021). Indeed, Lannoy and colleagues (2021) concluded that the measurement of binge drinking should include subjective drunkenness together with quantitative measures (intensity and frequency of alcohol use). Furthermore, Jander and colleagues (2016) found that the strongest effect of the intervention for binge drinking was associated with its prolonged use, suggesting that a longer intervention or the implementation of booster sessions may show an effect on this phenomenon. Another possible explanation to the lack of effect on binge drinking is the longer amount of time necessary to see a behavioral change (Velicer et al., 2013) that suggest the utility to provide long-term assessments. Binge drinking is one of the factors leading to

alcohol problems and represents an important outcome to evaluate at this age when a preventive intervention for alcohol use is implemented (Regan et al., 2020).

Regarding the other psychoactive substances, WBI reduced the odds to use e-cigarettes and cannabis in comparison with NI, but not tobacco. Working on PWB, instead of increasing knowledge about healthy behaviors, showed to be effective in reducing the use of e-cigarettes and preventing the increase in cannabis use at this age. Cannabis use increases from early to late adolescence (Chen & Kandel, 1995) and an intervention that reduces its increase can be considered protective for the health. The positive impact of WBI on substance use represents a crucial finding, considering the high vulnerability for unhealthy behaviors at this age. Indeed, this is the age to acquire autonomy from the family (Doumas et al., 2015) and to be more influenced by peers in implementing unhealthy behaviors (Laghi et al., 2012c). Moreover, in adolescence the brain development presents an imbalance between the areas responsible for the pursuit of pleasure and those responsible for impulse control and rational decision making (Balocchini et al., 2013; Blakemore, 2008).

Physical and sport activity, fruits and vegetables consumption and healthy diet showed a decrease in the three groups over time, in line with the tendency for adolescents to have a less healthy lifestyle from early to late adolescence (Marques et al., 2020). In this case, neither WBI nor LI had a protective effect. On the other hand, both the interventions showed a protective role on sleep at night and internet addiction. Previous findings showed that internet use and sleep problems were associated among adolescents (Cabré-Riera et al., 2019; Ekinci et al., 2014). The decrease in the scoring of internet addiction after the interventions (WBI and LI) probably had a positive long-term effect on sleep, which decreased in the group without intervention and remained almost unchanged in the groups undergoing one of the two interventions. Future research should test this hypothesis with longitudinal research. Based on sleep quantity, the mean of sleep hours in this sample was lower than those recommended (8 to 10 hours per night) (Hirshkowitz et al., 2015). In the future it will be important to measure sleep quality that is a better predictor of optimal sleep than the sleep quantity (Hirshkowitz et al., 2015; Olashore et al., 2020).

In line with the hypothesis, WBI increased the ability to solve problems, both systematically and methodically. Considering that during adolescence alcohol abuse seems to be a dysfunctional problem-solving strategy to deal with negative emotions and stress (Dreer et al., 2004; Jaffee & D'Zurilla, 2003; Williams & Kleinfelter, 1989), improving problem-solving abilities (in this case, methodical thinking) may lead to a lower risk to use alcohol to solve problems. Unexpectedly, also LI increased this ability. It may be explained by the fact that during the meetings, critical thinking about healthy behaviors was stimulated. This exercise could be generalized to other situations, improving the ability to use a systematic and methodical approach to solve problems. In adolescents who did not follow any intervention, this ability decreased over time.

Concerning psychological distress, WBI and LI had also a protective effect in depression score that increased less in comparison with the condition without intervention. Considering that depression, anxiety, and mood disorders significantly increase after puberty and throughout adolescence (Blakemore, 2008), the interventions showed a positive effect that needs to be developed and understood in future research. Preventing an increase in depression may have a protective impact on suicide risk and educational and social impairments in the long term, representing a crucial outcome (Beirão et al., 2020). On the other hand, WBI was not effective to decrease anxiety, somatization and hostility symptoms as previously found among Italian adolescents who had followed an intervention based on WBT (Ruini et al., 2006, 2009; Tomba et al., 2010). Finally, LI, but not WBI, had a positive effect on allostatic overload, showing that students who followed this intervention had lower chance to report the negative consequences of stressful events than their peers. It is likely that an intervention specifically based on health knowledge (LI) differently from an intervention based on psychological well-being (WBI), may reduce health symptoms included in the definition of allostatic overload.

Considering that most effects appeared after 6-month from the end of the intervention, it should be hypothesized that the changes in lifestyle, problem-solving abilities and psychological distress required a certain amount of time to appear. Therefore, it would be desirable to be able to test the

effects of these interventions over the long term to see if the changes seen at 6-month follow-up are maintained over time or if new improvements appear.

Strengths and limitations

The interpretation of the results should take into account the limitations of the study as elements on which to reflect in conducting future research. First, one limit is the high rates of dropouts at follow-ups, especially when the questionnaires were administered online because of the pandemic. This is in line with previous studies that showed high dropout rates and low adherence when an intervention was implemented online, reaching also rates higher than 70% (Elfeddali et al., 2012; Jander, Crutzen, Mercken, Candel, & de Vries, 2016; Kelders et al., 2012; Martinez-Montilla et al., 2020). When the online assessment had been implemented during lessons and under the supervision of researchers and a reward for participation had been offered to the students, retention rate improved (>92%) (Haug et al., 2017). Second, the administration of self-report questionnaires has been questioned because of potential biases due to social desirability, underestimation of alcohol consumption, and recall errors (Brener et al., 2003). Nevertheless, in adolescents, self-report measures seem to show good validity and reliability (Lintonen et al., 2004), especially when the assessment is anonymous (Brener et al., 2003). Third, the sample was not representative of Italian or international high school students because of the involvement of a restricted group of Italian high school students in a northern city of Italy (i.e., Ferrara). Further research should include samples larger and more representative of all Italian students, as well as other geographical areas (national and international). Fourth, students reported a lack of motivation in fulfill well-being diary, which is one of the pillar components of the WBT (Fava, 2016). Future research should improve their motivation making it more appealing or implementing in a web-based or smartphone application with reminders. For example, experience sampling technology involves a variety of approaches to engage participants and encourage introspection (van Agteren et al., 2021).

While there are several limitations to take into account, this study also has several strengths which should be considered. Strengths include the cluster RCT, intention to treat and mixed models analyses, the presence of a theory-based intervention and an active control group. The importance to include an active control group in RCT has been recently discussed (Guidi et al., 2018). Indeed, no-treatment control condition shows its inadequacy because of the lack of ingredients; the waiting list condition is not recommended for different reasons such as changes in condition during the period until the beginning of treatment; treatment as usual is usually not supervised or manualize and it is difficult to study the efficacy of an intervention when treatment as usual is combined with active treatment; attention placebo – more reliable than others - may be not a right choice because participant'acceptance is low and dropout rate is quite high (Guidi et al., 2018). However, an active intervention used as control group, in comparison with experimental group and a placebo condition, may be more appropriate in RCT (Guidi et al., 2018). Furthermore, this is one of the few studies that evaluate a preventive intervention that has been undertaken in Italy (Allara et al., 2019; Faggiano et al., 2014) and has used a theory-based intervention (Fava, 2016) to prevent risky behaviors. Finally, because the intervention can be implemented in the classroom to all students as a universal preventive intervention, it is conceivable that schools could easily apply it without having to select students based on specific characteristics, as personality (Lammers et al., 2017).

Conclusion

Behaviors and habits acquired during adolescence (e.g., alcohol use, binge drinking, unhealthy diet, sedentary behaviors) can be carried over into adulthood (Marques et al., 2020). Healthy behaviors tend to linearly decrease between early adolescence and the age of 15 years (Marques et al., 2020). Effective interventions that prevent the beginning or the increase of these unhealthy behaviors would have a positive impact on adolescents' health, their families, and the society. Indeed, chronic diseases

may appear at this stage and worsen over time leading to a loss of active workers and productivity and an increase in health care costs (Marques et al., 2020).

This study was not able to clarify the specific elements of the interventions that led to an improvement in lifestyle, problem-solving abilities, and psychological distress, in comparison with a condition where students follow the daily activities of the school. Therefore, future research should understand what are the specific elements of both interventions that resulted to be protective. Considering the increased need to conduct online interventions to reduce the costs of sustaining in-person interventions and from the new need to have to maintain distance during the COVID-19 pandemic, it is desirable to test the effectiveness of the interventions in the online modality.

CHAPTER 7: THE PROJECT DURING COVID-19

International research about mental health and lifestyle behaviors since the beginning of COVID-19

An outbreak of a new coronavirus disease (COVID-19) has spread from Wuhan, China, since December 2019 (Huang et al., 2020) and evolved rapidly in each continent, bringing the World Health Organization (WHO, 2020c) to declare it a pandemic on March 11, 2020. In Europe, Italy was one of the first countries that had to handle/tackle COVID-19 (Caffo et al., 2020). The virus SARS-CoV-2, that causes COVID-19 disease, is highly infectious, spreading mainly by respiratory droplets, even among people who are presymptomatic or non-symptomatic (Hsueh et al., 2020). Considering the high degree of contagion of the virus, governments faced the urgency to take drastic measures to slow the infection rate. These government regulations have affected the entire population, including young people, although the latter is less likely to have medical complications if infected (Efuribe et al., 2020; The Lancet Child Adolescent Health, 2020). Many countries implemented the "stay-at-home" orders to slow the spread of the virus (Sen et al., 2020). In Italy, as well, quarantine, and physical (social) distancing were the primary measures to curb the spread of the virus (Caffo et al., 2020). As of March 10, 2020, the Italian government has ordered Italians to remain at home, enabling the continuation of only necessary activities. This ban also impacted young people (16% of the Italian population) who saw the closing of schools, the cancellation of sports, the inability to go out with friends, and staying at home all the time with all family members who were not essential workers (Caffo et al., 2020). Before the ban that concerned all Italians, some activities had already stopped to contain the contagion. For instance, in Emilia-Romagna, schools stopped their activities as of February 24, 2020. The government maintained the most restrictive measures until May 3, 2020. Notwithstanding the decrease in the infection rate, schools remained close for the entire academic year until June 2020 with great uncertainty for the future (Caffo et al., 2020). The summer months saw an easing of

measures until the second wave of the virus began in October 2020. To meet the children and adolescents' educational needs, schools in different countries adopted homeschooling (i.e., home-based distance learning-model), even if some difficulties appeared, such as the lack of technology devices or internet connection for each family member (Caffo et al., 2020; Golberstein et al., 2020). Not all the youth experienced the same grade of difficulties and stress. Indeed, young people that live in poor socioeconomical condition, in small houses, experienced many difficulties like to follow school lectures, do physical activity at home, have privacy guaranteed (Golberstein et al., 2020). The school closure and social distancing may have a significant negative impact among adolescents who are in a developmental phase in which the relationships with peers are becoming fundamental for creating a social identity, having support, and the need for autonomy from family is one of the achievements of this age (The Lancet Child Adolescent Health, 2020). Social interactions with peers and schoolmates are valuable socialization experiences during adolescence (Knecht et al., 2011). Otherwise, social distancing and school closure may result in the reduction of face-to-face bullying, and engagement in risky behaviors with peers (e.g., the impossibility to meet friends at pubs or discos) (Danese & Smith, 2020; Ougrin, 2020). Preliminary results from adolescents' interviews showed both negative and positive effects of the social distancing (Braquinho et al., 2020; Rogers et al., 2020). On one hand, adolescents missed friends and family members who do not live with them, felt isolated, depressed, anxious, lonely, lost important life moments, increased substance use (Braquinho et al., 2020; Rogers et al., 2020). On the other hand, social distancing and school closure resulted in having more time with family members, improvement in friendships, more time to perform pleasant activities (Braquinho et al., 2020; Rogers et al., 2020). The biggest challenges in May 2020 for a sample of U.S. students (14-19 years-old) were academic/work habits and physical and mental wellbeing (Scott et al., 2020).

Differences on adolescents' psychological distress and lifestyle before and after the start of COVID-19

During the project "BE-DRY", the pandemic broke out worldwide and schools closed for several months to prevent infection. Therefore, 6-month follow-up after the end of the interventions was conducted during school hours in 7 classrooms between September-October 2019 (Before Pandemic, BP), and online in 4 classrooms between June-July 2020 (During Pandemic, DP). This different timing allowed to compare lifestyle and psychological variables of students who responded to the questionnaire before the pandemic exploded with students who responded approximately 3 months after the pandemic began.

Method

Groups (BP and DP) were compared at 6-month follow-up using t-test for continuous variables (problem-solving skills, psychological distress, and psychological well-being) and Chi-Square tests for categorical variables (lifestyle variables). The analyses were performed considering the treatment group (WBI and LI). Students from 2 classes that did not have any intervention (NI) were excluded from these analyses because filled in the questionnaires before the pandemic. There were not classes in NI group that were assessed during the pandemic. All data were analyzed with the Statistical Package for Social Science (SPSS, version 23). P-value was set to 0.05, two-tailed.

Results

Students from five classes (3 in WBI; 2 in LI) filled in the questionnaires before the pandemic; instead, four classes (2 in WBI; 2 in LI) were assessed during the pandemic.

In the WBI group, BP students were more likely to use alcohol ($\chi^2_{(2)} = 9.058$; $p = 0.003$) than students DP (*Table* 6). Students BP also had higher scores in a specific dimension of PWB, autonomy (t = 1.997; $p = 0.052$), than students DP (*Table* 6). Other differences did not emerge among students who had followed WBI (*Table* 6).

In the LI group, BP students were more likely to use alcohol ($\chi^2_{(2)} = 6.187$; $p = 0.013$) than students DP (*Table* 7). Students BP had higher scores in a dimension of PWB that was positive relations (t = 2.023; $p = 0.050$), and in a specific dimension of PSI that was Problem-Solving Engagement (t = 2.209; $p = 0.033$) than students DP (*Table* 7).

Discussion

Data collected during the project allowed to make a comparison between students who had experienced lockdown caused by pandemic and those who had not. These preliminary results showed that, regardless of treatment, students assessed during pandemic were less likely to drink alcohol than their peers before pandemic in both groups (WBI and LI). This may be explained by the fact that since the closure of schools and non-essentials workplaces, adolescents were more monitored by their parents by being more under their control, consistent with previous studies (Fiz Pérez & Ciancio, 2012; Kuntsche et al. 2004; Lippold et al., 2016). The fact that students in WBI group reported lower autonomy scores during the pandemic than their peers before pandemic is in line with this hypothesis. Another explanation of these findings may be due to the fact that young adolescents tend to drink alcohol primarily in social situations (Bartolini et al. 2013; ISTAT, 2016; Magidson et al., 2017). Therefore, being unable to go out and interact with peers, adolescents were not involved in social situations where drinking is more frequent (DeLay et al. 2016; Lin, 2016). Indeed, students who had followed LI showed lower scores in positive relations during pandemic than their peers before pandemic. However, recent studies have shown a reverse trend in which adolescents during pandemic drunk more often than before (Dumas et al., 2020; Lechner et al., 2020), also due to the emergence of different modes of drinking such as challenges on social networks (Dumas et al., 2020; MacMillan et al., 2021). However, these studies (Dumas et al., 2020; Lechner et al., 2020) involved populations of older adolescents who are more independent of their parents and under less control than younger adolescents.

Data from the project: the impact of COVID-19 in a sample of Italian adolescents

The Covid-19 pandemic has forced people to lock themselves in their homes, isolate themselves, and change their daily routines to prevent infection. These actions led to a reduction in infections, but the impact on lifestyle and psychological well-being has been shown to be crucial in several studies. In fact, being confined at home can lead to risky health behaviors such as increased sedentary behaviors, over-eating, increased use of technological devices which also has a negative impact on sleep (Lange & Nakamura, 2020).

Method

A convenience sample of Italian adolescents that had participated in the project "BE-DRY" was invited to answer to questions about the changes on their lifestyle and emotions during the COVID-19 pandemic. On a total sample of 74 students, 47 (63.5%) had replied to the questionnaire.

An anonymous self-report questionnaire was administered online from 27th February to 7th March 2021. Ad-hoc questions investigated changes in lifestyle (i.e., sleep hours, diet, tobacco, alcohol, cannabis, technology use, free time), relationships with friends, family climate and emotions felt during the pandemic.

Results

Forty-seven students (48.9% females; 12.8% males; 38.3% not known) filled in the questionnaire. Two classes (n = 21, 44.7%) had followed WBI and two other classes (n = 26; 55.3%) had followed LI during the project BE-DRY (from December 2019 to February 2020).

Regarding to sleep, 46.8% (52% WBI; 42% LI) stated that they have not changed their habits; 18.5% (10% WBI; 27% LI) slept less than usual; 14.5% (10% WBI; 19% LI) slept more than usual; 23.5% (24% WBI; 23% LI) went to bed later than usual; 6.5% (5% WBI; 8% LI) went to bed earlier than usual; 10% (5% WBI; 15% LI) slept late; 8.5% (5% WBI; 12% LI) woke up earlier than usual; 7% (14% WBI; 0% LI) had nightmares during the night; 13% (14% WBI; 12% LI) woke up during the night more than usual.

Regarding nutrition, 39.5% (48% WBI; 31% LI) did not change their behaviors. 20.5% (14% WBI; 27% LI) ate more than usual; 6.5% (5% WBI; 8% LI) ate less than usual; 12% (5% WBI; 19% LI) ate more packaged foods; 11% (10% WBI; 12% LI) ate less healthy foods. Instead, 12% (5% WBI; 19% LI) ate more homemade foods; 17% (19% WBI; 15% LI) ate more healthy foods.

Cigarette use did not change in 43.5% (48% WBI; 39% LI) of the population and 6.5% (5% WBI; 8% LI) quit smoking. In contrast, 10% (5% WBI; 15% LI) started smoking and 2% (0% WBI; 4% LI) smoked more than usual.

Fifty-five percent of the sample (48% WBI; 62% LI) report that they have not changed their alcohol drinking habits; 8.5% (5% WBI; 12% LI) have stopped drinking. On the other hand, 4.5% (5% WBI; 4% LI) have started drinking alcohol.

Concerning cannabis use, 44% (38% WBI; 50% LI) did not change their use; 6% (0% WBI; 12% LI) stopped using cannabis. None began using cannabis during the pandemic.

Seventy-three percent (81% WBI; 65% LI) of the sample admitted to use technology devices more than usual.

During the pandemic, when students were not attending classes, they spent their time watching movies, TV series, programs (tot= 68%; 71% WBI; 65% LI); on social networks (tot= 53%; 48% WBI; 58% LI); exercising (tot= 40. 5%; 19% WBI; 62% LI); engaging in hobbies (tot= 27%; 19% WBI; 35% LI); studying (tot= 19.5%; 24% WBI; 15% LI); reading books (tot= 16.5%; 10% WBI; 23% LI).

Regarding relationships with friends, 29% (19% WBI; 39% LI) said they had not changed. In 37.5% of cases (33% WBI; 42% LI) there were more interactions than usual; in 46.5% of cases (43% WBI; 50% LI) students said they felt closer to some people; and in 47% of cases (48% WBI; 46% LI) new friendships were formed. 6. 5% of the sample (5% WBI; 8% LI) said they felt friends less than usual; 11% (10% WBI; 12% LI) felt lonely; 16% (24% WBI; 8% LI) felt more emotionally distant from some people; 24% (29% WBI; 19% LI) broke off friendships.

Regarding time spent with family, 53% (48% WBI; 58% LI) said it had not changed, but 22% (29% WBI; 15% LI) reported more fighting and tension than usual and 2% (0% WBI; 4% LI) talked to family members less than usual. On the contrary, 23.5% (24% WBI; 23% LI) reported more pleasant times spent together and 21.5% (24% WBI; 19% LI) talked to their family members more than usual. During the pandemic, students felt different emotions: anxiety (tot= 54%; 62% WBI; 46% LI); sadness (tot= 50%; 38% WBI; 62% LI); happiness (tot= 47%; 48% WBI; 46% LI); anger (tot= 43.5%; 48% WBI; 39% LI); distrust of others (tot= 26%; 33% WBI; 19% LI); deep sadness (tot= 25.5%; 24% WBI; 27% LI); relaxation (tot= 20.5%; 14% WBI; 27% LI); panic (tot= 19%; 19% WBI; 19% LI); fear (tot= 14.5%; 14% WBI; 15% LI); disorientation (tot= 14.5%; 14% WBI; 15% LI); wrath (tot= 5%; 10% WBI; 0% LI).

Discussion

The COVID-19 outbreak has had an impact on adolescents' lifestyle, relationships, and emotions (Moore et al., 2020; Xiang et al., 2020). These results showed that adolescents reported worse habits and behaviors during the pandemic than before, underlining the negative impact that a stressful situation such as a pandemic can cause. For example, adolescents had reported irregular sleep patterns (e.g., to sleep less than usual, to wake up earlier than usual) with few differences between groups (WBI and LI). Other research showed negative changes in sleep among this population (Caffo et al., 2020; Wang et al., 2020). Sleep time and quality may have been negatively influenced by excessive use of technology. In fact, in this study, a large rate of adolescents reported to spend leisure time watching movies, TV series, programs and using social networks. Adolescents, indeed, deprived of their school routine, outdoor activities and social events, used technology to stay in touch with friends, to overcome boredom, or as a coping strategy against distress (Caffo et al., 2020; Guessoum et al., 2020; Munasinghe et al., 2020). The increase in time spent online and, consequently sedentary behaviors, was also accompanied by worse nutrition (e.g., to eat more than usual, to consume more unhealthy food than usual), as revealed by both some of the interviewed students and previous

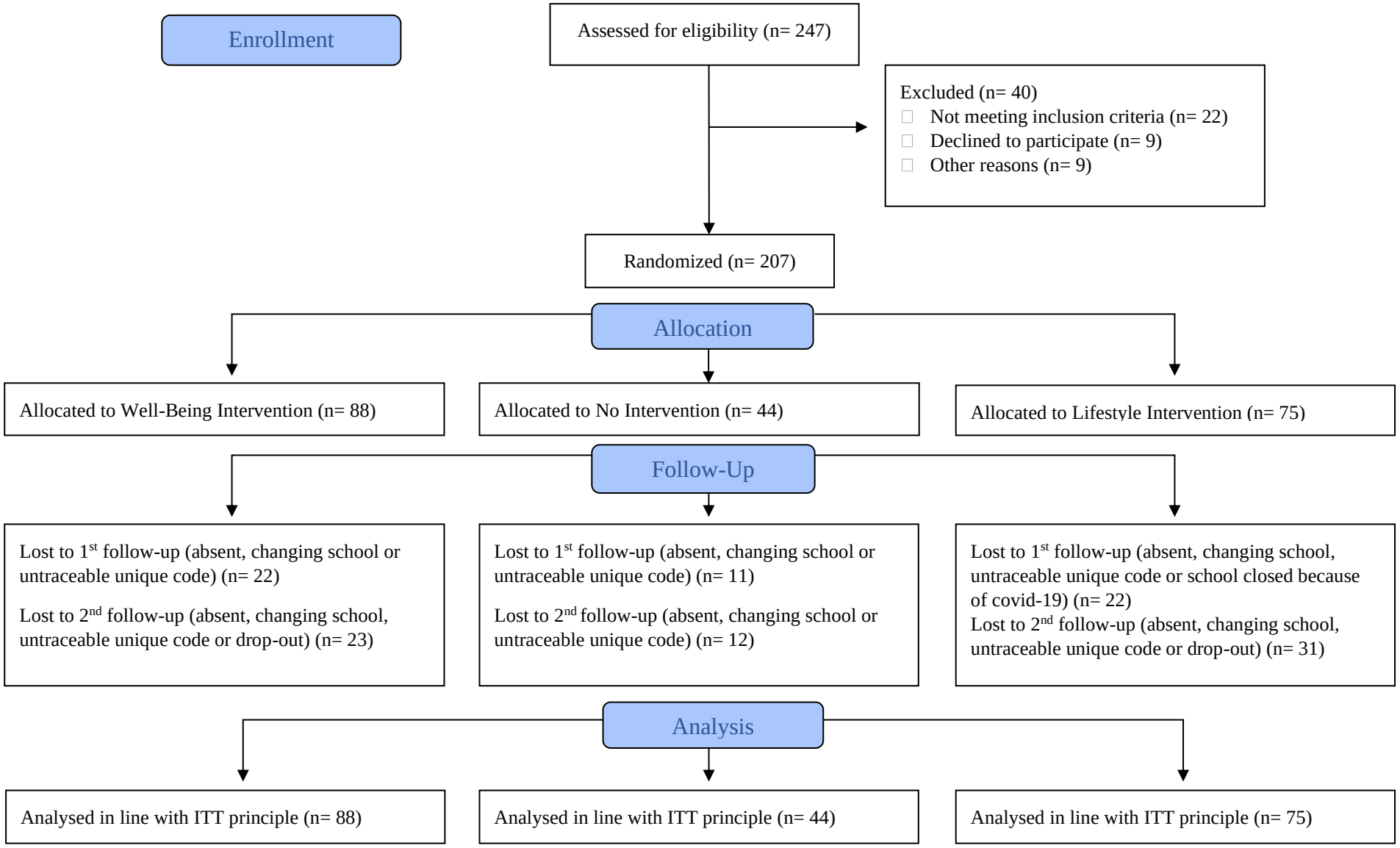
research (Bennett et al., 2021; Moore et al., 2020; Xiang et al., 2020). On the contrary, it also emerged a higher trend in cooking home-made recipes and increase in fresh products (Bennett et al., 2021). Indeed, almost half of the sample did not change their lifestyle such as sleep, nutrition, cigarette smoking, alcohol use, and cannabis use. The fact that a sample of adolescents did not change their substance use (tobacco, alcohol, cannabis) is in line with literature (Maggs, 2020). However, there were adolescents who increased their consumption (Dumas et al., 2020; Garnett et al., 2021; Jones et al., 2021). Risk factors associated with this trend should be well understood.

Most students in the current study reported making new friends, strengthening relationships, and having more contact and interactions with friends. According to previous research, adolescents replaced their peer relationships with virtual ones to cope with the pain of not being able to see their friends (Magson et al., 2020; Pellegrini & Maltinti, 2020). With regard to relationships with parents, students reported in similar percentages either to have experienced greater closeness with improvement in quality of the relationship or greater tensions and conflicts, in line with research on this topic (Guessoum et al., 2020; Jones et al., 2021; Rogers et al., 2020). The most experienced emotions during the recent lockdown by students were anxiety, sadness, and anger. During this particular period, anxiety was sometime shown to be an adaptive emotion being associated with increased protective behaviors (Rubaltelli et al., 2020). On the contrary, adolescents experienced poor mental health (e.g., anxiety, depression) especially if they did not have adaptive coping strategies to cope the prolonged isolation (Cauberghe et al., 2021). However, a large percentage reported also happiness. This result could be explained by the fact that these students took part in the interventions (WBI or LI). In fact, when compared to no intervention group, both WBI and LI yielded intriguing results in terms of coping strategies and depression. The interventions most likely had a protective effect during such a stressful time as lockdown.

In times of crisis like the one we are all experiencing because of Covid, the need to act in a preventive manner through the improvement of coping strategies and psychological well-being emerges even more strongly, especially in such a vulnerable segment of the population.

FIGURES

Figure 1. Consolidated Standards of Reporting Trials (CONSORT) diagram for participant flow.



TABLES

Table 1. Baseline sociodemographic and lifestyle characteristics of the students according to study group.

	WBI group	**LI group**	**NI group**
	Median (IQR)	**Median (IQR)**	**Median (IQR)**
Age	14 (0)	14 (1)	14 (0)
	Mean ± SD	**Mean ± SD**	**Mean ± SD**
GPA	7.07±0.88	6.64±0.74	6.81±0.73
Sleep at night (hours)	7.21±1.25	7.24±1.19	6.71±1.24
Internet addiction	7.85±4.63	7.56±3.94	7.93±4.1
	N (%)	**N (%)**	**N (%)**
Sex			
Male	34 (40)	28 (38.9)	14 (31.8)
Female	51 (60)	44 (61.1)	30 (68.2)
School			
High school	44 (50)	23 (30.7)	44 (100)
Technical/Professional	44 (50)	52 (69.3)	0 (0)
SES			
High	9 (10.6)	10 (13.7)	5 (11.6)
Middle	72 (84.7)	58 (79.5)	33 (76.7)
Low	4 (4.7)	5 (6.8)	5 (11.6)
Immigration			
First-generation	3 (4.6)	2 (4.5)	1 (3.1)
Second-generation	5 (7.7)	5 (11.4)	6 (18.8)
Physical activity	48 (57.8)	41 (56.9)	22 (52.4)
Sport activity	52 (59.8)	50 (66.7)	25 (56.8)
Fruits and vegetables	60 (70.6)	46 (61.3)	30 (68.2)
Healthy diet at home	56 (67.5)	40 (56.3)	26 (65)
Alcohol use	61 (69.3)	47 (62.7)	27 (61.4)
Binge Drinking	8 (9.1)	8 (10.8)	3 (6.8)
At-risk drinkers	16 (18.8)	15 (20.8)	7 (16.7)
Caffeine	75 (86.2)	55 (74.3)	32 (74.4)
Tobacco smoking	16 (18.4)	18 (24)	8 (18.2)
E-cigarettes use	14 (16.3)	16 (21.3)	4 (9.1)
Cannabis smoking	13 (14.9)	12 (16)	5 (11.4)
Use of other drugs	4 (4.7)	3 (4)	1 (2.3)

Abbreviations: WBI Well-Being Intervention; LI Lifestyle Intervention; NI No Intervention; GPA Grade Point Average

Table 2. Baseline psychological characteristics of the students according to study group.

	WBI group	**LI group**	**NI group**
	N (%)	**N (%)**	**N (%)**
Allostatic overload	18 (21.4)	22 (32.4)	10 (25)
	Mean ± SD	**Mean ± SD**	**Mean ± SD**
Symptom Questionnaire			
Anxiety	7.64±5.39	8.08±4.87	9.55±5.58
Depression	6.44±5.52	7.02±5.40	9.00±6.76
Somatization	8.07±5.36	7.48±5.43	10.43±6.93
Hostility	7.43±5.91	7.53±5.85	8.64±5.71
Psychosocial Index			
Stressful events	3.39±2.55	4.07±2.75	4.64±3.06
Quality of life	2.81±0.96	2.43±0.88	2.37±1.17
Problem-Solving Inventory			
Problem-Solving Engagement	54.17±10.78	50.94±10.11	56.16±12.03
Self-Assurance	29.04±8.01	29.82±6.80	29.42±7.21
Methodical Thinking	14.21±4.29	14.13±4.71	16.23±4.94
Total score	97.62±16.18	94.07±17.14	101.81±18.17
Psychological Well-Being Scales			
Autonomy	12.92±3.56	12.46±2.82	13.12±3.47
Environmental mastery	12.20±3.41	11.80±2.90	11.95±3.96
Personal growth	14.84±2.96	14.57±2.93	15.70±2.28
Positive relations	12.91±3.58	12.75±3.21	12.56±3.02
Purpose in life	11.14±2.94	11.39±2.89	10.98±3.58
Self-acceptance	11.61±3.63	11.26±3.17	10.65±3.85
Total score	75.13±11.50	74.44±9.30	74.95±12.22

Abbreviations: WBI Well-Being Intervention; LI Lifestyle Intervention; NI No Intervention

Table 3. Effect sizes

Outcomes	WBI (88)		LI (75)	
	ES (post-test)[a]	ES (6-month follow-up)[a]	ES (post-test)[a]	ES (6-month follow-up)[a]
AUDIT-total score	0.015	-0.421	-0.086	-0.51
Sleep	0.116	0.458	0.288	0.632
Internet Addiction	-0.482	-0.209	-0.545	-0.171
Problem-Solving Inventory				
Problem-Solving Engagement	-0.014	-0.014	0.057	0.006
Self-Assurance	-0.153	0.24	-0.148	0.29
Methodical Thinking	0.142	0.492	0.002	0.522
Total score	-0.087	0.209	0.036	0.294
Symptom Questionnaire				
Anxiety	0.113	-0.323	0.162	-0.399
Depression	-0.124	-0.429	-0.216	-0.474
Somatization	-0.008	-0.092	-0.03	-0.263
Hostility	0.046	-0.177	0.137	-0.182

Abbreviations: WBI Well-Being Intervention; LI Lifestyle Intervention; ES Effect Sizes

[a] Cohen's d values

Table 4. Changes in primary and secondary continuous outcomes for WBI, LI and NI groups.

Outcome[a]	Baseline, EMM (SE)	post-test, EMM (SE)	6-month, EMM (SE)	Time[b] *p*	Time[c] *p*	Adjusted difference in change, Mean (95% CI)[d]	Group-by-time[d], *p*	Adjusted difference in change, Mean (95% CI)[e]	Group-by-time[e], *p*	Adjusted difference in change, Mean (95% CI)[f]	Group-by-time[f], *p*	Adjusted difference in change, Mean (95% CI)[g]	Group-by-time[g], *p*
Lifestyle													
AUDIT-C_total													
WBI	1.2 (0.3)	1.5 (0.4)	1.7 (0.4)	0.158	**0.012**	0.03 (-0.55, 0.6)	0.924	-0.81 (-1.39, -0.21)	**0.008**	-0.19 (-0.69, 0.34)	0.476	-0.15 (-0.67, 0.37)	0.579
LI	1.1 (0.4)	1.3 (0.4)	1.5 (0.4)	0.789	0.202	-0.16 (-0.76, 0.45)	0.608	-0.96 (-1.58, -0.33)	**0.003**	-	-	-	-
NI	0.8 (0.5)	1.1 (0.5)	2.1 (0.5)	0.449	**<0.001**	-	-	-	-	-	-	-	-
Sleep													
WBI	7.1 (0.2)	7.0 (0.2)	6.8 (0.2)	0.765	0.069	0.14 (-0.35, 0.65)	0.574	0.57 (0.06, 1.07)	**0.029**	0.2 (-0.25, 0.64)	0.373	0.19 (-0.27, 0.65)	0.411
LI	7.1 (0.2)	7.2 (0.2)	7.0 (0.2)	0.834	0.703	0.35 (-0.18, 0.88)	0.201	0.76 (0.22, 1.3)	**0.006**	-	-	-	-
NI	6.8 (0.3)	6.5 (0.3)	5.9 (0.3)	0.463	**<0.001**	-	-	-	-	-	-	-	-
Internet Addiction													
WBI	8.0 (0.6)	7.4 (0.7)	8.1 (0.7)	0.318	0.963	-2.15 (-3.56, -0.74)	**0.003**	-0.93 (-2.35, 0.49)	0.202	-0.03 (-1.25, 1.2)	0.962	0.25 (-1.03, 1.52)	0.706
LI	7.5 (0.6)	6.8 (0.7)	7.8 (0.7)	0.383	0.757	-2.18 (-3.66, -0.69)	**0.004**	-0.69 (-2.21, 0.83)	0.380	-	-	-	-
NI	7.6 (0.8)	9.2 (0.9)	8.6 (0.9)	**0.027**	0.189	-	-	-	-	-	-	-	-
Problem-Solving Inventory													
Problem-Solving Engagement													
WBI	52.7 (1.7)	52.2 (1.8)	53.3 (1.8)	0.944	0.915	-0.16 (-5.34, 5.04)	0.953	-0.15 (-5.37, 5.1)	0.955	0.78 (-4.17, 5.74)	0.76	0.22 (-4.62, 5.07)	0.929
LI	50.5 (1.7)	50.8 (2.0)	51.4 (1.9)	0.991	0.891	0.62 (-4.94, 6.21)	0.828	0.07 (-5.49, 5.67)	0.981	-	-	-	-
NI	54.5 (2.1)	54.1 (2.3)	55.3 (2.3)	0.983	0.926	-	-	-	-	-	-	-	-
Self-Assurance													
WBI	29.0 (1.1)	30.9 (1.2)	30.6 (1.2)	0.217	0.357	-1.19 (-4.82, 2.4)	0.523	1.85 (-1.86, 5.55)	0.331	0.15 (-3.18, 3.49)	0.928	0.16 (-3.21, 3.55)	0.924
LI	29.8 (1.1)	31.8 (1.3)	31.6 (1.3)	0.287	0.389	-1.03 (-4.92, 2.82)	0.605	2.02 (-1.89, 5.93)	0.317	-	-	-	-
NI	30.1 (1.4)	33.2 (1.5)	29.8 (1.6)	0.107	0.981	-	-	-	-	-	-	-	-
Methodical Thinking													
WBI	14.7 (0.6)	15.3 (0.7)	15.8 (0.7)	0.677	0.248	0.64 (-1.56, 2.82)	0.567	2.23 (-0.02, 4.47)	**0.054**	-0.63 (-2.63, 1.37)	0.538	0.28 (-1.73, 2.29)	0.789

LI	14.3 (0.6)	14.2 (0.8)	15.7 (0.8)	0.994	0.197	0.01 (-2.35, 2.36)	0.993	2.5 (0.13, 4.88)	**0.041**	-	-	-	-
NI	16.6 (0.8)	16.5 (0.9)	15.4 (0.9)	0.994	0.443	-	-	-	-	-	-	-	-
Total score													
WBI	97.3 (2.8)	98.3 (3.0)	100.3 (2.9)	0.928	0.514	-1.48 (-9.92, 6.88)	0.731	3.56 (-4.94, 12.12)	0.419	2.12 (-6.03, 10.3)	0.615	1.61 (-12.12, 4.94)	0.696
LI	94.1 (2.8)	97.2 (3.2)	98.7 (3.1)	0.602	0.302	0.63 (-8.44, 9.67)	0.892	5.17 (-3.81, 14.19)	0.266	-	-	-	-
NI	101.4 (3.4)	103.9 (3.7)	100.8 (3.8)	0.743	0.986	-	-	-	-	-	-	-	-
Symptom Questionnaire													
Anxiety													
WBI	8.5 (0.8)	8.8 (0.9)	9.7 (0.8)	0.931	0.276	0.62 (-1.93, 3.16)	0.637	-1.77 (-4.29, 0.77)	0.176	0.22 (-2.09, 2.55)	0.852	-0.3 (-2.68, 2.06)	0.805
LI	8.7 (0.8)	9.2 (0.9)	9.6 (0.9)	0.842	0.599	0.84 (-1.85, 3.53)	0.544	-2.07 (-4.78, 0.65)	0.140	-	-	-	-
NI	9.5 (1.0)	9.1 (1.1)	12.5 (1.1)	0.945	**0.012**	-	-	-	-	-	-	-	-
Depression													
WBI	7.8 (1.0)	8.1 (1.0)	8.7 (1.0)	0.930	0.478	-0.75 (-3.17, 1.58)	0.540	-2.58 (-4.96, -0.22)	**0.036**	-0.55 (-2.7, 1.69)	0.629	-0.26 (-2.47, 2.04)	0.820
LI	8.0 (1.0)	7.7 (1.1)	8.6 (1.1)	0.944	0.770	-1.3 (-3.82, 1.22)	0.320	-2.84 (-5.35, -0.26)	**0.031**	-	-	-	-
NI	9.3 (1.4)	10.3 (1.5)	12.8 (1.5)	0.552	**0.001**	-	-	-	-	-	-	-	-
Somatization													
WBI	8.8 (0.9)	10.0 (1.0)	11.7 (1.0)	0.367	**0.003**	-0.05 (-2.91, 2.83)	0.973	-0.55 (-3.39, 2.27)	0.704	-0.13 (-2.74, 2.46)	0.919	-1.05 (-3.7, 1.59)	0.443
LI	8.0 (0.9)	9.1 (1.0)	9.9 (1.1)	0.532	0.171	-0.18 (-3.17, 2.81)	0.905	-1.6 (-4.64, 1.42)	0.306	-	-	-	-
NI	9.9 (1.1)	11.2 (1.3)	13.4 (1.3)	0.532	**0.008**	-	-	-	-	-	-	-	-
Hostility													
WBI	7.8 (0.8)	8.7 (0.9)	9.1 (0.9)	0.477	0.236	0.27 (-2.21, 2.74)	0.834	-1.03 (-3.48, 1.43)	0.414	0.53 (-1.77, 2.82)	0.655	-0.02 (-2.32, 2.27)	0.987
LI	7.9 (0.8)	9.3 (1.0)	9.1 (1.0)	0.257	0.366	0.79 (-1.85, 3.43)	0.558	-1.05 (-3.68, 1.57)	0.437	-	-	-	-
NI	7.6 (1.1)	8.3 (1.2)	9.9 (1.1)	0.811	0.062	-	-	-	-	-	-	-	-

Abbreviations: EMM Estimated Marginal Means; SE Standard Error; WBI Well-Being Intervention; LI Lifestyle Intervention; NI No Intervention

[a] All models were adjusted for school, sex, and socioeconomic status

[b] Within-group effect from baseline to post-test

[c] Within-group effect from baseline to 6-months

[d] Group-by-time effect from baseline to post-test with NI as the reference level

[e] Group-by-time effect from baseline to 6-months with NI as the reference level

[f] Group-by-time effect from baseline to post-test with LI as the reference level

[g] Group-by-time effect from baseline to 6-months with LI as the reference level

Table 5. Changes in primary and secondary categorical outcomes for the intervention (WBI and LI) and control (NI) groups.

Outcome	Baseline	post-test	6-month	AOR[a] (post-test)	*p*	AOR[a] (6-month)	*p*	AOR[b] (post-test)	*p*	AOR[b] (6-month)	*p*
	N (%)	N (%)	N (%)	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Binge Drinking											
WBI	8 (9.1)	8 (9.1)	10 (11.4)	0.39 (0.01, 12.22)	0.59	0.64 (0.02, 16.87)	0.79	1.62 (0.09, 27.5)	0.74	0.29 (0.01, 6.45)	0.43
LI	8 (10.7)	9 (12)	3 (4)	0.63 (0.02, 22.26)	0.80	0.18 (0.01, 6.79)	0.36	-	-	-	-
NI	3 (6.8)	3 (6.8)	6 (13.6)	-	-	-	-	-	-	-	-
At-risk drinkers											
WBI	16 (18.2)	17 (19.3)	18 (20.5)	4.44 (0.13, 152.1)	0.41	0.002 (0.0, 0.14)	**0.004**	0.66 (0.03, 14.62)	0.79	0.15 (0.01, 3.74)	0.25
LI	15 (20)	11 (14.7)	6 (8)	2.95 (0.06, 135.9)	0.58	0.0004 (0.0, 0.03)	**0.0006**	-	-	-	-
NI	7 (15.9)	5 (11.4)	13 (29.5)	-	-	-	-	-	-	-	-
Tobacco smoking											
WBI	16 (18.2)	13 (14.8)	10 (11.4)	4.85 (0.06, 377.84)	0.48	0.06 (0.01, 2.67)	0.14	1.75 (0.1, 31.97)	0.7	15.6 (0.55, 437.2)	0.11
LI	18 (24)	15 (20)	8 (10.7)	8.51 (0.1, 749.03)	0.35	0.87 (0.02, 47.03)	0.94	-	-	-	-
NI	8 (18.2)	5 (11.4)	6 (13.6)	-	-	-	-	-	-	-	-
E-cigarettes use											
WBI	14 (15.9)	4 (4.5)	4 (4.5)	0.15 (0.01, 4.58)	0.28	0.01 (0.01, 0.35)	**0.01**	0.74 (0.02, 22.43)	0.86	5.37 (0.16, 183.2)	0.35
LI	16 (21.3)	6 (8)	4 (5.3)	0.11 (0.01, 4.36)	0.24	0.07 (0.01, 1.81)	0.11	-	-	-	-
NI	4 (9.1)	2 (4.5)	6 (13.6)	-	-	-	-	-	-	-	-
Cannabis smoking											
WBI	13 (14.8)	12 (13.6)	15 (17)	0.01 (0.01, 0.18)	**0.01**	0.01 (0.01, 3.52)	0.11	81.58 (0.01, 4433097.11)	0.43	1.76 (0.01, 70600.32)	0.92
LI	12 (16)	11 (14.7)	6 (8)	0.03 (0.01, 1106)	0.51	0.01 (0.01, 288.6)	0.36	-	-	-	-
NI	5 (11.4)	7 (15.9)	7 (15.9)	-	-	-	-	-	-	-	-
Physical activity											
WBI	48 (54.5)	31 (35.2)	32 (36.4)	0.78 (0.16, 3.81)	0.76	1.84 (0.37, 9.14)	0.45	1.55 (0.38, 6.28)	0.54	1.77 (0.44, 7.2)	0.42
LI	41 (54.7)	28 (37.3)	24 (32)	1.22 (0.23, 6.42)	0.81	3.27 (0.6, 17.78)	0.17	-	-	-	-
NI	22 (50)	16 (36.4)	10 (22.7)	-	-	-	-	-	-	-	-
Sport activity											
WBI	52 (59.1)	36 (40.9)	36 (40.9)	1.37 (0.18, 10.18)	0.76	1.55 (0.19, 12.46)	0.68	0.72 (0.1, 4.93)	0.74	1.06 (0.14, 7.81)	0.95
LI	50 (66.7)	33 (44)	25 (33.3)	0.98 (0.11, 8.51)	0.99	1.64 (0.17, 15.90)	0.67	-	-	-	-
NI	25 (56.8)	16 (36.4)	17 (38.6)	-	-	-	-	-	-	-	-

Fruits and vegetables consumption											
WBI	60 (68.2)	45 (51.1)	46 (52.3)	1.37 (0.23, 8.16)	0.73	1.48 (0.24, 8.95)	0.67	0.99 (0.21, 4.7)	0.991	1.48 (0.29, 7.52)	0.634
LI	46 (61.3)	32 (42.7)	29 (38.7)	1.36 (0.22, 8.29)	0.74	2.19 (0.34, 14.23)	0.41	-	-	-	-
NI	30 (68.2)	21 (47.7)	21 (47.7)	-	-	-	-	-	-	-	-
Healthy diet at home											
WBI	56 (63.6)	44 (50)	46 (52.3)	1.45 (0.3, 6.94)	0.64	1.44 (0.3, 6.86)	0.65	0.59 (0.15, 2.26)	0.44	1.35 (0.33, 5.45)	0.67
LI	40 (53.3)	27 (36)	28 (37.3)	0.86 (0.17, 4.34)	0.86	1.95 (0.37, 10.16)	0.43	-	-	-	-
NI	26 (59.1)	20 (45.5)	20 (45.5)	-	-	-	-	-	-	-	-
Allostatic overload											
WBI	18 (20.5)	10 (11.4)	22 (25)	3.45 (0.55, 21.78)	0.19	1.17 (0.27, 4.97)	0.83	0.04 (0.01, 0.43)	**0.008**	0.14 (0.03, 0.58)	**0.007**
LI	22 (29.3)	1 (1.3)	7 (9.3)	0.14 (0.01, 1.98)	0.15	0.16 (0.03, 0.84)	**0.03**	-	-	-	-
NI	10 (22.7)	3 (6.8)	12 (27.3)	-	-	-	-	-	-	-	-

Abbreviations: WBI Well-Being Intervention; LI Lifestyle Intervention; NI No Intervention

[a] Reference level: NI, baseline

[b] Reference level: LI, baseline

Table 6. Differences on lifestyle and psychological variables between students assessed before pandemic (BP) and during pandemic (DP) in the WBI group.

	Students BP (N=46)	**Students DP (N=19)**		
	N (%)	N (%)	χ^2	*p*
Physical activity	23 (50)	10 (52.6)	0.037	0.847
Sport activity	28 (60.9)	10 (52.6)	0.376	0.540
Fruits and vegetables consumption	34 (73.9)	12 (63.2)	0.752	0.386
Healthy diet at home	31 (67.4)	15 (78.9)	0.868	0.352
Alcohol use	35 (76.1)	7 (36.8)	9.058	**0.003**
Binge Drinking	6 (13)	4 (21.1)	0.663	0.416
At-risk drinkers	13 (28.3)	5 (26.3)	0.025	0.873
Caffeine	38 (82.6)	17 (89.5)	0.487	0.485
Tobacco smoking	6 (13)	2 (10.5)	0.079	0.779
E-cigarettes use	4 (8.7)	0 (0)	1.761	0.185
Cannabis smoking	10 (21.7)	5 (26.3)	0.159	0.690
Use of other drugs	1 (2.2)	1 (5.3)	0.430	0.512
	Mean ± SD	Mean ± SD	t	*p*
Symptom Questionnaire				
Anxiety	9.72±5.77	9.11±4.39	0.413	0.681
Depression	7.61±5.28	8.26±4.33	-0.475	0.637
Somatization	11.65±6.87	9.92±5.67	0.970	0.336
Hostility	9.22±5.45	9.92±5.16	-0.475	0.637
Problem-Solving Inventory				
Problem-Solving Engagement	55.54±10.16	53.33±8.74	0.829	0.410
Self-Assurance	30.84±8.49	29.18±5.31	0.951	0.346
Methodical Thinking	15.49±4.48	14.61±2.78	0.962	0.341
Total score	101.87±18.04	97.12±10.51	1.323	0.191
Psychological Well-Being Scales				
Autonomy	12.09±3.52	10.48±2.67	1.997	**0.052**
Environmental mastery	11.94±3.80	11.79±3.06	0.154	0.878
Personal growth	15.11±2.61	14.97±3.04	0.189	0.851
Positive relations	12.11±2.89	11.85±1.50	0.475	0.636
Purpose in Life	11.38±2.38	10.32±2.33	1.650	0.104
Self-acceptance	11.49±3.76	11.01±2.72	0.500	0.619
Total score	74.11±12.01	70.41±7.14	1.533	0.131

Table 7. Differences on lifestyle and psychological variables between students assessed before pandemic (BP) and during pandemic (DP) in the LI group.

	Students BP (N=31)	**Students DP (N=13)**		
	N (%)	N (%)	χ^2	*p*
Physical activity	18 (58.1)	6 (46.2)	0.524	0.469
Sport activity	18 (58.1)	8 (61.5)	0.046	0.831
Fruits and vegetables consumption	21 (67.7)	9 (69.2)	0.009	0.923
Healthy diet at home	21 (67.7)	8 (61.5)	0.157	0.692
Alcohol use	24 (77.4)	5 (38.5)	6.187	**0.013**
Binge Drinking	3 (9.7)	0 (0)	1.350	0.245
At-risk drinkers	6 (19.4)	0 (0)	2.913	0.088
Caffeine	25 (80.6)	9 (69.2)	0.679	0.410
Tobacco smoking	6 (19.4)	1 (7.7)	0.931	0.335
E-cigarettes use	3 (9.7)	1 (7.7)	0.044	0.834
Cannabis smoking	7 (22.6)	0 (0)	3.491	0.062
Use of other drugs	2 (6.5)	0 (0)	0.879	0.349
	Mean ± SD	Mean ± SD	t	*p*
Symptom Questionnaire				
Anxiety	8.39±4.96	9.80±4.44	-0.886	0.381
Depression	7.29±5.14	8.60±4.81	-0.783	0.438
Somatization	9.45±6.44	8.88±4.98	0.285	0.777
Hostility	7.90±5.44	11.30±4.57	-1.974	0.055
Problem-Solving Inventory				
Problem-Solving Engagement	54.61±11.33	46.30±11.56	2.209	**0.033**
Self-Assurance	32.90±7.45	28.77±5.75	1.786	0.081
Methodical Thinking	15.55±4.24	15.18±4.59	0.254	0.801
Total score	103.06±20.29	90.25±18.32	1.964	0.056
Psychological Well-Being Scales				
Autonomy	12.84±4.03	11.80±2.10	1.122	0.268
Environmental mastery	12.39±2.57	11.83±2.62	0.660	0.513
Personal growth	14.16±3.03	13.87±2.42	0.305	0.762
Positive relations	13.03±3.51	11.40±1.82	2.023	**0.050**
Purpose in Life	12.00±2.93	10.65±3.47	1.321	0.194
Self-acceptance	11.13±3.33	10.51±2.12	0.612	0.544
Total score	75.55±12.71	70.05±4.97	2.060	**0.046**

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