Longitudinal associations between dispositional mindfulness and addictive behaviors in adolescents

Asociaciones longitudinales entre el rasgo de mindfulness y conductas adictivas en adolescentes

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Abstract

Adolescence is a vulnerable period for the development of addictive behaviors, and substance use (SU) and problematic Internet use (PIU) typically start during this developmental stage. Dispositional Mindfulness (DM) has been proposed as a protective factor for adolescents against numerous psychological problems. Previous studies have suggested that the Observing facet of DM may moderate the other facets' roles. The objective of this study was to longitudinally analyze whether the facets of DM could predict lower levels of PIU and SU among adolescents, and to assess whether the Observing facet moderated the associations between the other facets of DM and addictive behaviors. A total of 836 participants aged 11 to 18 completed measures of PIU, SU, and the five facets of DM. The results indicated that Acting with Awareness predicted lower SU, Describing predicted an increase in both PIU and SU, and Non-judging marginally predicted lower PIU. Furthermore, Observing was beneficial against PIU when combined with high levels of Acting with Awareness, but was not when combined with high levels of Describing. The implications and future directions for the empirical study of DM against addictive behaviors are discussed.

Key words: dispositional mindfulness, problematic Internet use, substance use, adolescents.

Resumen

La adolescencia es un período vulnerable para el desarrollo de conductas adictivas. El uso de sustancias (US) y el uso problemático de Internet (UPI) generalmente comienzan durante esta etapa de desarrollo. El mindfulness rasgo (MD) se ha propuesto como un factor protector para los y las adolescentes frente a numerosos problemas psicológicos. Estudios previos sugieren que la faceta Observar de MD puede moderar los roles de las otras facetas. El objetivo del presente estudio fue analizar longitudinalmente si las facetas de MD podían predecir niveles más bajos de UPI y US entre los y las adolescentes, y evaluar si la faceta Observar moderaba las asociaciones entre las otras facetas de MD y las conductas adictivas. Un total de 836 participantes de entre 11 y 18 años completaron medidas de UPI, US y las cinco facetas de MD. Los resultados indicaron que Actuar con conciencia predijo niveles más bajos de US, Describir predijo un aumento tanto de UPI como de US y No juzgar predijo marginalmente niveles más bajos de UPI. Además, la faceta Observar fue beneficiosa frente a UPI cuando se combinó con altos niveles de Actuar con conciencia, pero no fue beneficiosa cuando se combinó con altos niveles de Describir. Se discuten las implicaciones y direcciones futuras para el estudio empírico de MD frente a conductas adictivas.

Palabras clave: rasgo de mindfulness, uso problemático de Internet, uso de sustancias, adolescentes.

Received: July 2020; Accepted: November 2020.

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Adolescence is considered a developmental stage characterized by numerous changes at the biological, social, cognitive, and affective levels. These changes make this stage a vulnerable period for adolescents to develop higher levels of addictive behavior, as substance use (SU) normally begins in adolescence (Bava & Tapert, 2010). The average age at which SU begins to show an increased prevalence is 14 years, with first alcohol consumption typically occurring at this age, and first consumption of other illegal substances, such as cannabis and cocaine, occurring at 15 years (Spanish Drug Observatory, 2019). Additionally, in recent years, with the expansion of Internet use among young people, Internet addiction or problematic Internet use (PIU) has emerged. PIU is characterized by behaviors associated with poor control, continuous use, and cognitive concern regarding the Internet, which can carry a series of negative consequences in different areas of an individual's life (Caplan, 2010). The results of a study conducted with large sample of Spanish adolescents indicated that the prevalence of PIU was high, reaching 16.3% (Gómez, Rial, Braña, Golpe & Varela, 2017). These addictive behaviors are, in turn, related to higher levels of psychological and physical health problems (Brownlie et al., 2019; Restrepo et al., 2020). Further, different studies indicate that PIU and SU are related to each other (Gámez-Guadix, Orue, Smith & Calvete, 2013b).

Taking into account the rates of both risk behaviors and their early onset in adolescence, it is necessary to identify protective factors that help prevent the development of these problems. Recently, interest has increased in mindfulness-based interventions, with Dispositional Mindfulness (DM) serving as a beneficial factor in preventing the development of numerous psychological problems in different populations, including adolescents.

Dispositional Mindfulness, Substance Use, and Problematic Internet Use

DM has been defined as a multidimensional construct (e.g., Baer, Smith, Hopkins, Krietemeyer & Toney, 2006; Bishop et al., 2004). Baer et al. (2006) indicate that it is a trait consisting of five different facets: (1) Observing: The ability to attend to internal and external experiences such as perceptions, thoughts, sensations or feelings; (2) Describing: The ability to describe internal experiences through words; (3) Acting with Awareness: The ability to be focused to one's activities at the moment; (4) Non-judging: The ability not to judge internal experiences such as thoughts and feelings; and (5) Non-reacting: The ability to avoid getting carried away by internal experience (Baer et al., 2006). These facets may have different roles, depending on the nature of a psychological problem (Cortazar & Calvete, 2019), emphasizing the importance of evaluating the trait of mindfulness through its different facets. However, one of the limitations to drawing conclusions regarding the role that DM has in protecting against different psychological problems is that many previous studies focus on one or only some facets of DM. Additionally, there are numerous scales to evaluate the construct, some of which are one-dimensional or focus only on some facets of DM. However, previous studies indicate that there is overlap between some facets as measured with different instruments. For example, the Mindful Attention Awareness Scale (MAAS-A; Brown, West, Loverich & Biegel, 2011; Spanish version: Calvete, Sampedro & Orue, 2014) has shown associations with the Acting with Awareness facet of the Five Facet Mindfulness Questionnaire (FFMQ; Quaglia, Braun, Freeman, McDaniel & Brown, 2016), and the Child and Adolescents Mindfulness Measure (CAMM; Greco, Baer & Smith, 2011; Spanish version: Guerra et al., 2019; Turanzas Romero, 2013) has shown associations with the Acting with Awareness and Non-judging facets of the FFMQ (Calvete & Royuela-Colomer, 2016).

At the cross-sectional level, some studies found that Acting with Awareness was associated with lower levels of PIU (Gámez-Guadix & Calvete, 2016), such as compulsive use of mobile phones and social networks (Apaolaza, Hartmann, D'Souza & Gilsanz, 2019; Kircaburun, Griffiths & Billieux, 2019). At the longitudinal level, Calvete, Gámez-Guadix, and Cortazar (2017a) found that all facets of DM (except Non-reacting) predicted lower PIU levels in adolescents.

Regarding SU, a meta-analysis indicated that, although many studies showed negative relationships with DM, these results are mixed, as other studies have not found these relationships or even found positive relationships (Karyadi, VanderVeen & Cyders, 2014). For example, in adolescents, scores on the CAMM, which combines Acting with Awareness and Non-judging, were associated with lower alcohol and marijuana consumption (Robinson, Ladd & Anderson, 2014), and Describing was associated with lower alcohol consumption (Fernández, Wood, Stein & Rossi, 2010). Likewise, the results of another cross-sectional study conducted with an adult clinical sample showed that these three facets of DM were negatively associated with SU (Bowen & Enkema, 2014). However, Karyadi et al. (2014) did not find significant associations for Observing or Describing, while Acting with Awareness, Non-judging, and Non-reacting showed significant negative associations. Moreover, most extant studies have been cross-sectional, and very few have been conducted with adolescent samples. A recent study with an adolescent sample did not find significant predictions between MAAS scores (i.e., Acting with Awareness) and SU (Calvete, Orue & Sampedro, 2017b).

The role of the Observing facet of DM has been debated. Although many previous studies have found that the Observing facet can be maladaptive in samples of non-meditators (e.g., Baer et al., 2006; Calvete, Fernández-González,

Echezarraga & Orue, 2019; Royuela-Colomer & Calvete, 2016), some studies indicated that this facet can be beneficial when interacting with other DM skills for different psychological problems (e.g., Desrosiers, Vine, Curtiss & Klemanski, 2014; Eisenlohr-Moul, Walsh, Charnigo, Lynam & Baer, 2012). Specifically, in a sample of university students, Eisenlohr-Moul et al. (2012) found that Observing was associated with lower SU (i.e., tobacco and alcohol) only in interaction with other facets, such as Non-reacting. Contrastingly, Bowen and Enkema (2014) did not find significant support for this interaction. Furthermore, to our knowledge, there are no studies that evaluate the interactions between Observing and other facets of DM to examine changes in PIU. However, a recent meta-analysis (Sala, Rochefort, Priscilla Lui & Baldwin, 2020) suggested that Observing may be positively related to health behaviors when other DM skills are high, which indicates the need to evaluate how the combination of DM facets can influence health behaviors.

Overview of the Current Study

Although previous studies have evaluated the relationship between DM and risk behaviors such as PIU and SU, these studies generally used cross-sectional designs. Longitudinal studies are necessary to evaluate the extent to which facets of DM predict these risk behaviors. Furthermore, most previous studies have been conducted with adults; however, as mentioned above, these risky behaviors tend to emerge in adolescence. Finally, most existing studies examine DM through a single facet or a one-dimensional construct, making it difficult to determine the specific relationships between each facet and addictive behaviors or the potential interactions between Observing and the other facets.

Therefore, the main objective of the current study was to analyze whether the five facets of DM can predict lower levels of PIU and SU over time in a sample of adolescents. Based on a literature review, Describing, Acting with Awareness, Non-judging, and Non-reacting were expected to predict lower levels of PIU and SU over time. Likewise, the second objective was to evaluate potential interactions between Observing and the other facets of the DM construct in predicting changes in PIU and SU. The Observing facet was expected to predict lower levels of PIU and SU only when combined with high levels of other DM facets, thus mitigating the dysfunctional role that Observing may have in samples of non-meditators.

Method

Participants

A total of 836 students between the ages of 11 and 18 (M_{age} = 14.65 years, SD = 1.74) comprised the baseline of the current study (423 girls and 413 boys). The distribution by age was: 11 (7.4%), 12 (17.2%), 13 (9.9%), 14 (16.5%), 15 (24.4%), 16 (15.8%), 17 (8%), and 18 (0.7%). Of this initial sample, 650 students participated in the study's second wave (retention rate = 77.75%). The criteria suggested by the Spanish Society of Epidemiology (2000) were followed to calculate participants' socioeconomic status: 13.6% low, 15.5% low-medium, 29.1% medium, 16.2% high-medium, and 25.7% high.

Procedure

The participants were students at six randomly selected schools from the entire list of public and private schools in Araba and Bizkaia (Spain). More specifically, two public and four private schools participated in the study. The students participated voluntarily with the consent of their parents or legal guardians. The schools' directors were informed of the study's goals, and after receiving their approval, we sent them information about the research aims and their respective informed consent to the students and their parents. All students completed the questionnaires in their classrooms with a researcher present, and their responses were anonymous. We linked their answers over the two waves of the study (six months apart) using a code that only the participants knew. The Ethics Committee of the University of Deusto approved this study.

Measures

Dispositional Mindfulness. DM was assessed with the Spanish version of the FFMQ adapted to adolescents (Baer et al., 2006; Royuela-Colomer & Calvete, 2016). This self-report questionnaire assesses the five facets of DM (i.e., Observing, Describing, Acting with Awareness, Non-judging, and Non-reacting) with 39 items. Items are answered on a Likert scale ranging from 1 (*never or rarely true*) to 5 (*very often or always true*). Some sample items are "I can easily put my beliefs, opinions, and expectations into words;" "When I do things, my mind wanders off and I'm easily distracted;" and "I perceive my feelings and emotions without having to react to them." The psychometric properties of FFMQ in children and adolescent samples have been examined in previous studies (for a review, see Cortazar, Calvete, Fernández-González & Orue, 2020). In the present study, Cronbach's α coefficients were .75, .75, .82, .86, and .68, for Observing, Describing, Acting with Awareness, Non-judging, and Non-reacting, respectively.

Problematic Internet Use. PIU was assessed with the Generalized Problematic Internet Use Scale 2 (GPIUS2; Caplan, 2010). The GPIUS2 is a 15-item self-report questionnaire that measures generalized and PIU. Items are answered using a Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Some sample items are "When I haven't been online for some time, I become preoccupied with the thought of going online" and "I find it difficult to control my Internet use." For the present study, total PIU scores

were used, and we used the Spanish version of the GPIUS2 (Gámez-Guadix, Orue & Calvete, 2013a). The psychometric properties of the GPIUS2 were found to be adequate in both the original and Spanish versions (Caplan, 2010; Gámez-Guadix et al., 2013a). In this study, Cronbach's α coefficients for the total score were .92 at Time 1 (T1) and .91 at Time 2 (T2).

Substance Use. SU was assessed with the Adolescents Drugs Abuse Inventory (Calvete & Estévez, 2009). This self-report scale comprises nine items about the frequency of consumption of different substances. In the present study, we assessed the frequency of consumption of alcohol, marijuana, hashish, cocaine, speed, and ecstasy. Items are answered using a Likert scale ranging from 0 (*never*) to 5 (*daily*). In the present study, Cronbach's α coefficients for the total score were .64 at T1 and .65 at T2.

Data Analyses

Little's MCAR test indicated that missing data was not random, χ^2 (103) = 218, $p < .000$. Those who only participated in the first wave scored lower on Acting with Awareness ($t = -2.81$, $p = .005$, $d = -0.23$) and Non-judging ($t = -3.31$, $p = .001$, $d = -0.27$) and higher on PIU ($t = 2.59$, $p = .01$, $d = 0.23$), SU ($t = 6.17$, $p = .000$, $d = 0.63$), and age ($t = 8.99$, $p = .000$, $d = 0.75$). Thus, to manage missing values, we used the Full Information Maximum Likelihood (FIML) method with MPLUS 8. The hypothesized model included: (1) cross-sectional associations between all study variables at T1 and T2, (2) autoregressive paths from variables at T1 to the same variables at T2 (PIU and SU), (3) cross-lagged predictive paths from T1 DM dimensions to T2 PIU and SU, and (4) predictive paths from the interaction terms between Observing and the other four DM dimensions (i.e., Acting with Awareness x Observing, Non-judging x Observing, Describing x Observing, and Non-reacting x Observing). Following the standard procedure for examining moderation effects, all DM dimensions were transformed into z scores at T1. The interaction figures were created by means of a macro by Dawson (2018).

The model's goodness-of-fit was evaluated using the comparative fit index (CFI), non-normative fit index (NNFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Generally, CFI and NNFI values of .90 or higher reflect good fit, and RMSEA and SRMR values lower than .08 indicate excellent fit (Hu & Bentler, 1999).

Preacher and Coffman's (2006) calculator was used to conduct a power analysis, that is, to calculate the probability of detecting an effect, if there is a true effect present to detect. The power in the present study was 99.9% for a sample of 836 participants. All data are available at the Open Science Framework (https://osf.io/p2967/).

Results

Descriptive Statistics and Correlational Analysis

Table 1 shows the descriptive statistics and correlation coefficients between all study variables. Generally, the dimensions of DM were negatively associated with PIU and SU at T1 and T2. Specifically, Acting with Awareness and Non-judging were negatively associated with both PIU and SU at both timepoints, while Describing was negatively associated only with PIU at T1. PIU and SU were positively associated with each other at both timepoints.

Predictive Model

The predictive model via path analysis displayed excellent fit indices $c^2(36, N = 836) = 1085.063$, RMSEA = .052 (90% CI [.034–.072]), SRMR = .02, NNFI = .92, CFI = .98. The model explained 42% of the variance of PIU at T2, and 50% of the variance of SU at T2.

Figure 1 displays the significant and marginally significant longitudinal paths of the model. The autoregressive paths for PIU and SU were statistically significant, indicating the high stability of both variables over time. Regarding predictive paths from T1 DM dimensions to measures of addictive behaviors at T2, Acting with Awareness predicted lower SU, and Non-judging marginally predicted lower PIU; however, Describing predicted an increase in both PIU and SU. Furthermore, an interaction term between Acting with Awareness and Observing predicted changes in PIU.

Figure 2 shows the form of this interaction for adolescents that scored low (z = −1) and high (z = 1) on the Acting with Awareness and Observing dimensions. The predictive association between T1 Observing and T2 PIU was negative when Acting with awareness was high. Finally, an interaction term between Describing and Observing marginally predicted changes in PIU. Figure 3 shows the form of this interaction for adolescents that scored low (z = −1) and high (z = 1) on these dimensions. The findings indicated that Observing could predict less PIU only when Describing was low.

Discussion

The present study longitudinally evaluated the role that the differentiated facets of DM have in protecting against PIU and SU. Likewise, taking into account the maladaptive role of the Observing facet in the face of numerous problems, the interactions between Observing and the other facets of DM were evaluated to predict changes in PIU and SU.

Cross-sectional results, in accordance with previous studies (e.g., Kircaburun et al., 2019; Robinson et al., 2014), indicated negative associations between most of the DM facets (i.e., Acting with Awareness, Non-judging, and Describing) and both SU and PIU. At the longitudinal

Table 1. *Correlations coefficients between variables and descriptive statistics*.

	1	2	3	4	5	6	7	8	9	10
1. T1 PIU										
2. T1 SU	.15**									
3. T1 O	.04	.04								
4. T1 D	−.10**	−.03	.22**							
5. T1 AA	−.37**	−.25**	−.10**	.25**						
6. T1 NJ	−.34**	−.10**	−.27**	.17**	.40**					
7. T1 NR	−.02	.04	.41**	.37**	−.04	−.10**				
8. T2 PIU	.63**	.16**	.02	−.03	−.27**	−.27**	−.01			
9. T2 SU	.13**	.65**	.05	.03	−.21**	−.09*	.02	.16**		
10. Age	.30**	.52**	.07*	−.02	−.34**	−.19**	.02	.30**	.44**	
Mean	1.90	0.32	2.81	3.16	3.50	3.67	2.71	1.90	0.30	14.65
SD	0.91	0.47	0.74	0.67	0.75	0.82	0.65	0.87	0.49	1.74

Note. T1 = Time 1; T2 = Time 2; PIU = Problematic Internet use; SU = Substance use; O = Observing; D = Describing; AA = Acting with awareness; NJ = Non-judging; NR = Non-reacting. * p ‹ .05. ** p ‹ .01.

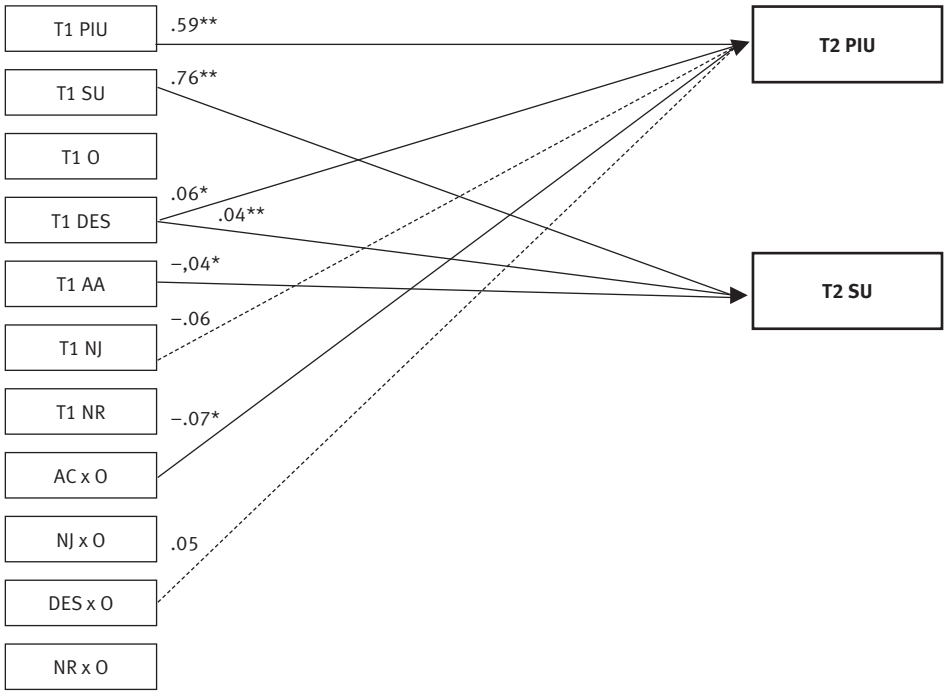

Figure 1. Statistically significant longitudinal paths of the general model.

Note. T1 = Time 1; T2 = Time 2; PIU = Problematic Internet use; SU = Substance use; AA = Acting with Awareness; NJ = Non-judging; NR = Non-reacting; DES = Describing; O = Observing. Values provided are standardized coefficients. *p ‹ .05. **p ‹ .01. ***p ‹ .001. The broken lines represent marginally significant paths (p = .07).

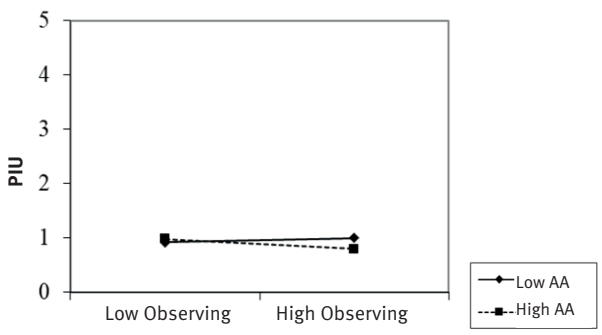

Figure 2. Interaction between Acting with Awareness and Observing for PIU.

Note. PIU = Problematic Internet use; AA = Acting with Awareness.

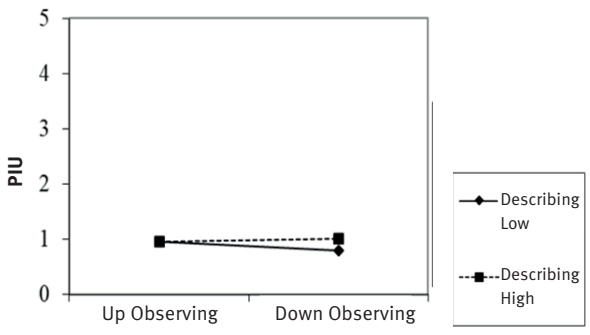

Figure 3. Interaction between Describing and Observing for PIU.

Note. PIU = Problematic Internet use.

level, the Acting with Awareness predicted lower SU levels and Non-judging marginally predicted lower PIU levels over time, which was consistent with the results of previous studies (e.g., Calvete et al., 2017a; Robinson et al., 2014). It has been suggested that adolescents who are more able to not judge their internal experiences and who can act conscientiously may be more likely to accept their negative emotions and realize when they are not behaving in a healthy manner (Sala et al., 2020). Therefore, they may be less likely to attempt to alleviate their emotional distress through SU or PIU than other adolescents.

Contrary to previous studies (e.g., Bowen & Enkema, 2014; Calvete et al., 2017a), Describing predicted increased levels of both PIU and SU. Furthermore, Describing appeared to have a maladaptive role for PIU, especially in combination with high levels of Observing. There are several tentative explanations for these findings. It has been suggested that describing and labeling in words what one feels, if not done properly, may lead to less participation in health-promoting behaviors (Sala et al., 2020). Additionally, it may be that adolescents who observe and describe their emotions the most are those who experience the most negative emotions, and the association between negative emotions and addictive behaviors (Kassel et al., 2007) could therefore explain this result.

In the present study, Observing was not found to be significantly predictor of either SU or PIU. This finding was in line with the results obtained in a meta-analysis conducted by Karyadi et al. (2014), which indicated Observing could not predict SU; however, it contrasted the results obtained by Calvete et al. (2017a), who found that Observing played an adaptive role in relation to PIU. This difference could be because Calvete et al. (2017a) only examined direct paths between DM facets and PIU, while the current study included the interaction terms between Observing and the other facets. In fact, the present results are consistent with previous literature that highlights that this facet can be beneficial in interaction with other DM facets (Desrosiers et al., 2014; Eisenlohr-Moul et al., 2012). In this study, Observing was beneficial against PIU when combined with high levels of Acting with Awareness. Numerous studies have shown how the Observing facet is more adaptive in samples of meditators (e.g., Baer et al., 2006; 2008), which indicates that they may be more able than others to act with awareness, not judge internal experiences, and not react impulsively. Thus, it appears that Observing can protect adolescents from PIU only when they also have the ability to act with awareness. In fact, these results are consistent with the idea that those who score high on Observing should try to develop the Acting with Awareness facet (Sala et al., 2020).

Limitations and Future Research

The present study has some limitations. First, all evaluations were conducted using self-report measures. Future research could include other sources of information, such as peer or/and parental reports. Second, Non-reacting and SU measures showed low reliability, which may be conditioning the results obtained with respect to these variables. In the case of SU, the low consistency may be because the use of one particular substance does not have to be associated with the use of other substances. Third, although this study included a large sample of adolescents, the age range was wide. It would be interesting for future studies to evaluate whether the findings of the present study are maintained or differ in different age ranges. Finally, despite this being a longitudinal study, future studies could include more timepoints or a longer interval between measurements, to observe whether the results are maintained over time.

Despite its limitations, this study also has several strengths, such as its longitudinal design. To our knowledge, most extant research in this area has been cross-sectional; therefore, it is important to perform studies that allow for the evaluation of how the facets of DM protect against SU and PIU over time. Furthermore, this study was conducted with a large sample of adolescents. Considering that many addictive behaviors that persist in adulthood begin in adolescence, it is important to have more research that allows us to determine protective factors for adolescents against increasingly frequent problems, such as PIU and SU.

Conclusion

This study indicates that not all the facets of DM are beneficial against PIU and SU in adolescents. Specifically, it appears that the Non-judging and Acting with Awareness facets may play relevant roles for adolescents when facing these problems. Furthermore, Acting with Awareness seems to protect those adolescents with high levels of Observing. Regarding Describing, it would be interesting for future studies to analyze in detail the role of this facet in combination with other variables, such as levels of stress and emotional distress.

Overall, the findings of this study may provide useful information for the development of new mindfulness-based interventions aimed at preventing addictive behaviors in adolescents. The techniques aimed at improving the different dimensions of DM should depend on the addictive behavior to be prevented. Thus, if the results of this study are confirmed by other studies, interventions aimed at reducing SU could include techniques to enhance the ability to acting with awareness, whereas those aimed at reducing PIU should enhance the ability of adolescents to not judge their internal experiences.

Acknowledgements

This work was supported by a grant from the Ministerio de Economía y Competitividad (Spanish Government, Ref.

PSI2015-68426-R), from the Basque Country (Ref. IT982-16 and Ref. PI_2016_1_0023), and from BBVA (PR[18]_SOC_0096). Neither had a role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Conflict of interests

Declarations of interest: none

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