Original investigation

Smoking Behavior: A Cross-Sectional Study to Assess the Dimensionality of the Brief Wisconsin Inventory of Smoking Dependence Motives and Identify Different Typologies Among Young Daily Smokers

Luca Pancani MSc, Marco D'Addario PhD, Erika Rosa Cappelletti MSc, Andrea Greco PhD, Dario Monzani PhD, Patrizia Steca PhD

Department of Psychology, Università degli Studi di Milano—Bicocca, Milan, Italy

Corresponding Author: Luca Pancani, MSc, Department of Psychology, Università degli Studi di Milano—Bicocca, Piazza dell'Ateneo Nuovo 1, 20126 Milan, Italy. Telephone: 39-02-6448-3865; Fax: 39-02-6448-3799; E-mail: l.pancani@campus.unimib.it

Abstract

Introduction: The present study aims to investigate the dimensionality of the brief version of the Wisconsin Inventory of Smoking Dependence Motives (B-WISDM) and identify different smoking motivational profiles among young daily smokers ($N = 375$).

Methods: We tested 3 measurement models of the B-WISDM using confirmatory factor analysis, whereas cluster analysis was used to identify the smokers' motivational profiles. Furthermore, we compared clusters toward dependence level and the number of cigarettes smoked per day using analysis of variance tests.

Results: The results confirmed that the B-WISDM measures 11 first-order intercorrelated factors. The second-order model, originally proposed for the longer version of the questionnaire, showed adequate fit indices but fitted the data significantly worse than the first-order model. Five motivational clusters were identified and differed in terms of tobacco addiction and the number of cigarettes smoked per day. Although each cluster had specific features, 2 main smoker groups were distinguished: Group A (composed of 3 clusters), which was mainly characterized by high levels of secondary dependence motives, and Group B (composed of 2 clusters), in which the primary and secondary dependence motives reached similar levels. In general, the clusters of Group B were more addicted to cigarettes than Group A clusters.

Conclusions: Using the B-WISDM to identify different smoking motivational profiles has important practical implications because they might help characterize addiction, which represents the first step to help an individual quit smoking.

Introduction

The World Health Organization (report on the global tobacco epidemic, 2013)¹ considers tobacco consumption as one of the biggest global public health threats because it kills nearly 6 million individuals every year. Tobacco addiction is surely due to a pharmacological

dependence on nicotine, but this is not the only reason behind smoking. A basic step to quit smoking consists of identifying the reasons for dependence. Effectively, one of the earliest interests of the psychological literature regarding tobacco addiction has been to identify smokers' motives for smoking. Since 1960, different models and scales have been developed to explain why individuals use tobacco.^{2–8}

Recent progress from these initial models has been performed by Piper et al.⁹ who suggest that dependence is a multidimensional construct and a motivational phenomenon, thus smoking dependence can be measured by assessing the motives behind tobacco use. From this perspective, the authors developed a new 68-item questionnaire, the *Wisconsin Inventory of Smoking Dependence Motives* (WISDM). The WISDM measures 13 motivational factors, namely affiliative attachment, automaticity, behavioral choice-melioration, cognitive enhancement, craving, cue exposure/associative processes, loss of control, negative reinforcement, positive reinforcement, social/environmental goads, taste-sensory properties, tolerance, and weight control. In several studies, the WISDM has demonstrated good psychometric properties, such as good internal consistency and concurrent, discriminant, and predictive validity.^{10–17} Through an extensive psychometric analysis, Piper et al.¹⁵ noted the presence of two synthetic WISDM scales, namely primary dependence motives (PDM) and secondary dependence motives (SDM). PDM is composed of four scales (automaticity, craving, loss of control, and tolerance) and represents the core component of tobacco dependence, whereas SDM is composed of the nine remaining scales. Furthermore, the authors identified five smoker typologies based on the WISDM. Four of these typologies had similar profiles that only differed in the mean level of each motive, therefore classifiable into Very Low, Low, Medium, and High profiles. The remaining profile was called the Automatic-Atypical profile because it had PDM levels similar to the High profile and SDM levels similar to the Low profile. In 2010, Smith et al.¹⁸ reduced the scale length using a factor analysis and item-to-total correlations. The resulting brief WISDM (B-WISDM) comprised 37 items that measure 11 scales: negative and positive reinforcements were consolidated into a general “affective enhancement” scale, whereas behavioral choice/melioration and affiliative attachment were consolidated into a new “affiliative attachment” scale. There is an absence of evidence regarding the B-WISDM psychometric properties mainly because of its recent development, but some studies have replicated its factorial structure and have suggested that it has good internal consistency and validity.^{19,20} However, other studies are required to assess the psychometric properties of the B-WISDM. In particular, the model that includes PDM and SDM was only tested by Vajer et al.²⁰ The authors observed that both models had adequate fit indices, but the first-order model was better than the second-order model.

The present study had two main goals. The initial aim was to investigate the B-WISDM's dimensionality and assess whether the factorial structure proposed in the literature^{18,20} was replicable in an Italian sample of young adult daily smokers, focusing in particular on the second-order model because it is unconfirmed. The second aim was to identify types of smokers using the B-WISDM. We expected to observe profiles similar to those identified by Piper et al.¹⁵ using the WISDM. Motivational typologies were then compared for smoking behavior indices. We hypothesized that smokers with high levels of B-WISDM motives, in particular PDM factors, would have a high reliance on tobacco and smoke more cigarettes per day. Moreover, we predicted that SDM levels, which are important for describing smoking behavior, do not influence dependence. Hence, if the PDM levels of two typologies are similar, their dependence levels must be similar regardless of the SDM levels. To the best of our knowledge, no previous studies have used the B-WISDM to identify smokers' motivational profiles and then investigate addiction levels. Typifying smokers, particularly young individuals,

could have important, practical implications because it represents an essential initial step for effective interventions aimed at helping individuals quit.

Methods

Participants and Procedure

The following two participation criteria were established: (a) the participants had to be habitual smokers (at least one cigarette per day for at least 1 year) of packed or handmade cigarettes and (b) their age had to be between 18 and 30 years old. Three hundred and seventy-five participants (187 females and 188 males; $M_{\text{age}} = 23.28$, $SD_{\text{age}} = 2.80$) completed the questionnaire during January 2013. The participants reported smoking between 1 and 40 cigarettes per day ($M = 9.80$; $SD = 6.27$). For educational level, 64% of the participants were high-school graduates, 16% had a bachelor's or master's degree, and the remaining 20% had an education lower than high school. Regarding occupation, 33% of the participants were students, 36% were workers, 19% were students and workers simultaneously, and 12% were unemployed.

The present study was advertised by social networks and the participants were all volunteers. Individuals who intended to participate were invited to the University of Milan – Bicocca. Aims of the study were explained to the participants and, once the consent form was read and accepted, they completed the questionnaire by themselves.

Measures

Brief Wisconsin Inventory of Smoking Dependence Motives

The B-WISDM, developed by Smith et al.¹⁸, is a theoretically derived questionnaire based on the WISDM.⁹ The questionnaire was translated into Italian and then back-translated into English by two native English language translators. The questionnaire is composed of 37 items answered on a 7-point Likert scale, where 1 indicates “Not true of me at all” and 7 indicates “Extremely true of me.” The questionnaire comprised 11 subscales that represent different dependence motivations: loss of control, automaticity, craving, tolerance, affiliative attachment, cognitive enhancement, cue exposure/associative processes, social/environmental goads, affective enhancement, taste, and weight control.

Fagerström Test of Nicotine Dependence

The Fagerström Test of Nicotine Dependence (FTND)²¹ is a 6-item scale that measures nicotine dependence and it was validated in an Italian sample by Ferketich et al.²² The FTND is the most widely used self-reported measure of nicotine dependence, although it has some psychometrics limitations, in particular regarding its low internal consistency^{23–25} and dimensionality.^{21,24,26–28}

Cigarette Dependence Scale

The Cigarette Dependence Scale (CDS-12)²⁹ is a 12-item self-report questionnaire that provides a continuous measure of cigarette addiction. This questionnaire was developed to overcome FTND psychometric limitations and to emphasize aspects of dependence as defined in both the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the International Classification of Diseases (ICD-10).^{30,31} Examples of these aspects, which are not investigated by the FTND,^{9,23,32–34} include tolerance, a persistent desire for the substance, and unsuccessful efforts to control its use. Compared to the FTND, the CDS-12 shows higher internal consistency and test-retest reliability, and a better predictive validity in respect to smoking cessation and withdrawal intensity.^{34–36}

Statistical Analyses

The initial step of the analysis aimed to investigate the dimensionality of the B-WISDM. Three nested models derived from the literature^{18,20} were tested using confirmatory factor analysis (CFA): Model 1 contained 11 first-order correlated factors, Model 2 contained another 11 first-order correlated factors with an estimation of error covariance for the four item pairs reported by Smith et al., and Model 3 was identical to the previous model but included two second-order factors, namely PDM and SDM. Since the normalized estimate of the Mardia's coefficient^{37,38} was higher than 3, we assumed that the multivariate distribution of data was not normal; thus, robust maximum likelihood was used as estimation method. Four fit indices were used to evaluate each model. The comparative fit index and Tucker-Lewis index must approach 0.95 to demonstrate a good model fit, although values higher than 0.90 were considered acceptable.³⁹ The root mean squared error of approximation represents an excellent fit when smaller than 0.05 and an adequate fit for values below 0.08, whereas the standardized root mean square residual had to be below 0.08.⁴⁰ The specialized computation for the Satorra-Bentler χ^2 difference⁴¹ was used to compare models: a nonsignificant value of the resulting χ^2 , computed for the difference between degrees of freedom of the two models compared, indicates that the less restricted model does not fit significantly better than the more restricted model. The statistical software Mplus version 6.11 was used to perform the CFAs.⁴² When the optimal model was identified, internal consistency for the entire B-WISDM and its subscales were calculated with Cronbach's alpha.

The second step typified smokers depending on their levels of B-WISDM dimensions. In order to achieve this goal, a cluster analysis was performed using the software SLEIPNER 2.1.⁴³ Even though Piper et al.¹⁵ used a latent profile analysis (LPA), cluster analysis was preferred because the assumption of local independence was considered too hard: covariances of the variables included in the analysis might not be explained just by class membership (as prescribed for LPA) but also by the two high-ordered dimensions found for the WISDM¹⁵ and hypothesized for the B-WISDM. Asendorpf et al.⁴⁴ suggested the adoption of a two-step clustering procedure: initially using Ward's hierarchical method⁴⁵ followed by a nonhierarchical K-means method. Concerning the hierarchical method, different solutions were chosen based on the decrease in the explained error sum of squares (ESS) as suggested by Bergman.⁴⁶ In the latter non-hierarchical method, four indices were used to evaluate the optimal number of clusters: the C-index,⁴⁷ the G(+),⁴⁸ the Gamma,⁴⁹ and the Point-biserial correlation.⁵⁰ The minimum value of the former two indices and maximum of the latter two indices suggest the optimal number of clusters to be retained, hence the best cluster solution.

The final step of the analysis investigated the possible differences among the clusters using a one-way analysis of variance (ANOVA). The clusters were considered as an independent variable, whereas the number of cigarettes smoked per day (NCD) and scores on

the two dependence tests (FTND and CDS-12) were considered as dependent variables.

Before performing the analysis, missing data from the B-WISDM items were substituted using *hot deck imputation*.^{51,52} As suggested by Roth,⁵² this procedure is recommended when the percentage of missing data is lower than 10%, regardless of the pattern of missing data. Hot deck imputation, implemented with SPSS version 20,⁵³ replaces a missing value with the value of a similar "donor" in the dataset. In our analysis, the "donor" was identified by the sex and age of the participants. Participants with many missing values (five or more) were removed from the sample, whereas participants with missing values on the FTND and CDS-12 were neither removed nor replaced.

Results

Before performing the analysis, 3 participants out of 375 were removed from the sample because of multiple missing data on B-WISDM items. Among the 372 remaining participants, 18 had at least one missing data. Since the percentage of missing data was very low (0.2%), a hot deck imputation⁵¹ was used to replace the missing data.

Dimensionality of the B-WISDM

The dimensionality of the B-WISDM was assessed using CFAs. Three nested models were tested. Model 1 was nested within Model 2: both were models with 11 first-order correlated factors, but in Model 2, the error covariances for the four item pairs reported by Smith et al.¹⁸ were freely estimated. Model 3 was identical to Model 2 but included the estimation of two second-order correlated factors, namely PDM and SDM. The fit indices for the three models are reported in Table 1.

The fit indices of all the models were within the acceptable range but suggested a superior fit for Model 2. In order to choose the optimal model, the specialized computation for the Satorra-Bentler χ^2 difference was used to compare the models. Model 1 fitted significantly worse than Model 2 ($\chi^2_{\text{diff}} = 142.816$, $df_{\text{diff}} = 4$, $p < .001$), indicating that the estimated error covariances were necessary to reduce the model misspecification. Model 2 showed a significantly better fit than Model 3 ($\chi^2_{\text{diff}} = 185.287$, $df_{\text{diff}} = 43$, $p < .001$), suggesting that the first-order solution represented the optimal solution to explain our data, although fit indices of Model 3 did not allow to completely reject it. Models 2 and 3 are depicted in Figure 1. The two models showed very similar standardized factor loadings on the first-order factors. These parameters exceeded 0.60, except for the items of cue exposure/associative processes: in general, Model 2 showed lower loadings than Model 3. Regarding Model 2, correlations between factors were all positive and significant, except for social/environmental goods that did not correlate with loss of control, taste, and

Table 1. The Fit Indices for the Three Confirmatory Factor Analysis Models of B-WISDM

	Model description	Satorra-Bentler χ^2	df	CFI	TLI	RMSEA	SRMR
Model 1	11 first-order factors	1200.703	574	0.914	0.900	0.054	0.045
Model 2	11 first-order factors with error covariances	1026.107	570	0.938	0.927	0.046	0.042
Model 3	11 first-order and 2 second-order factors with error covariances	1216.355	613	0.917	0.910	0.051	0.058

CFI = comparative fit index; RMSEA = root mean squared error of approximation; SRMR = standardized root mean square residual; TLI = Tucker-Lewis index.

Figure 1. The results of the confirmatory factor analysis for Model 2: the residual variances and loadings are standardized. *Note.* All coefficients are significant ($p < .001$). All factors are correlated. Primary dependence motives are displayed on the left and secondary dependence motives on the right.

weight control. Regarding Model 3, the results revealed a difference between the loadings for the second-order factors: the PDM values ranged from 0.70 to 0.97, whereas the SDM ranged from 0.25 to 0.85. Concerning the SDM, the low loadings of taste, weight control, and social/environmental goals generated a problem in the dimensionality of SDM. A new model was tested with these three factors loading on a new second-order factor, but the fit indices were not acceptable. Furthermore, the high correlation between PDM and SDM (0.834) generated a problem of discriminant validity and was considered as a further evidence that Model 2 was better than Model 3. Therefore, an additional model with only one second-order factor was tested, but many of the fit indices were not acceptable. Hence, Model 2 was considered the optimal model to fit our data.

Cronbach's alpha was calculated for each first- and second-order factor and the entire B-WISDM score. Cronbach's alpha values all exceeded .80, thus suggesting good internal consistency among all the scales except for cue exposure/associative processes ($\alpha = .64$).

Types of Smokers

The second step of the analysis consisted of typifying smokers based on their dependence motives. The mean values of the different B-WISDM subscales were calculated for each participant and then used as input data for the two-step cluster analysis. An initial attempt to cluster the participants yielded unclear, not interpretable results due to the floor effect of weight control and ceiling effect of

taste; hence, these two subscales were removed from the following cluster analysis. Two solutions were chosen according to the criteria of Bergman⁴⁶: the five- and seven-cluster solutions. The fit indices did not indicate one solution as the best cluster solution. The Gamma and G(+) suggested a seven-cluster solution, the Point-biserial correlation indicated a five-cluster solution, and the C-index value was identical for the two solutions. A five-cluster solution was chosen for several nonstatistical reasons. First (1), identifying seven groups of participants did not greatly contribute ESS although the ESS was higher in the "larger" (56.83) than in the "smaller" solution (53.02). Second (2), in the seven-cluster solution, there were two "very small" clusters composed of 23 and 37 participants (6.18% and 9.95% of the sample, respectively). The final reasons were based on the cluster compositions of the two solutions. Regarding the seven-cluster solution, three clusters remained nearly identical in the smaller solution (3) because they were composed of nearly identical participants, whereas two clusters were unclear (4) but became more interpretable when arranged with the other two clusters in the five-cluster solution. These considerations yielded the five-cluster solution as optimal. The five clusters comprised a similar number of smokers ranging from 64 to 81.

For the cluster patterns (reported in Figure 2), it was possible to distinguish two large groups: Group A comprised Clusters 1, 2, and 3, and Group B comprised Clusters 4 and 5. These two groups were qualitatively different, whereas the clusters within each group

Figure 2. The levels of dependence motives for each cluster identified in the five-cluster solution. *Note.* AA = affiliative attachment; AU = automaticity; AE = affective enhancement; CA = cue exposure/associative processes; CE = cognitive enhancement; CR = craving; LC = loss of control; PDM = primary dependence motives; SDM = secondary dependence motives; SG = social/environmental goals; TL = tolerance.

only differed from a quantitative perspective. The relationships between the B-WISDM subscales were nearly identical when comparing clusters within a group; the differences between them only depended on the mean level of the motivational factors. Clusters in Group A were characterized by higher SDM than PDM levels, in particular social/environmental goals, which were highest in each of these clusters. Within Group A, the dependence motives were highest for Cluster 3 followed by Cluster 2 and Cluster 1, which appeared to be composed of the less dependent smokers in the entire sample. Regarding clusters in Group B, there were no differences between PDMs and SDMs because the levels of the different motives were similar. The motive levels of Cluster 5 were higher than those of Cluster 4, but these two clusters were qualitatively more similar than the clusters in Group A. Although the categorization in two macrogroups might help for an initial interpretation of profiles, it did not deal exhaustively with the explanation of profiles. Clusters 1 and 5 could be considered as opposed profiles since the former was characterized by low levels of both PDMs and SDMs, whereas the latter by high levels of both. Clusters 3 and 4 were nearly identical in the level of PDMs, but the former was characterized by higher levels of SDMs. Among SDMs, each dimension showed some variability between different profiles, except for social–environmental goals: Clusters 1 and 4 were characterized by an identical low level of social motive, whereas this motive reached the highest level in Clusters 2 and 3 and, to some degree, also in Cluster 5.

Differences Between Clusters

The clusters were then compared based on tobacco dependence and the NCD. Cluster membership was used as the independent variable, whereas the scoring on two dependence tests (FTND and CDS-12) and the NCD were the dependent variables. Levene's test showed nonhomogeneity of the variances for each dependent variable; therefore, a Welch robust test was used to compare the clusters. The results (shown in Table 2) showed that each dependent

variable varied across the clusters. The effect size, calculated with ω^2 , suggested that approximately one half of the CDS-12 scoring variance was accounted for the cluster membership followed by FTND and NCD. A series of Tamhane post-hoc tests were performed to assess how the dependent variables could discriminate between the clusters. Regarding the FTND and NCD, the post-hoc test suggested a distinction at three levels: high dependence for Cluster 5, intermediate dependence for Clusters 3 and 4, and low dependence for Clusters 1 and 2. Regarding CDS-12, a further dependence level could be identified: this test discriminated between the low dependence typical of Cluster 2 and a lower dependence typical of Cluster 1.

Discussion

The present study had two main aims: to investigate the dimensionality of the shorter version of the WISDM (B-WISDM; Smith et al.¹⁸) and to identify different motivational profiles behind daily tobacco use in a sample of young Italian smokers.

For the dimensionality of B-WISDM, our analysis confirmed the 11 first-order correlated factors reported in previous studies.^{18–20} The second-order model, which includes PDM and SDM, respectively, was also tested and showed fit indices that were adequate but slightly lower than the first-order model. Our results were consistent with those obtained by Vajer et al.: a difference test demonstrated the better fit of the first-order model, even if the second-order solution could not be rejected both because of its fit indices and because of its theoretical importance. In general, loadings on first-order factors were satisfactory for both models, as well as loadings on the PDM for the second-order model, whereas taste, weight control, and social/environmental goals had low loadings on SDM. Similar results were observed by Vajer et al. These loadings (in particular, social/environmental goals) appeared to suggest the presence of another second-order factor, but our results did not confirm this possibility.

Table 2. Cluster Comparisons on the Dependence Tests (FTND and CDS-12) and Number of Cigarettes Smoked Per Day (NCD)

Cluster	Mean	SD	ω^2	Levene's test (<i>df</i>)	Welch test (<i>df</i>)	Tamhane post-hoc test
FTND						
C1	0.84	1.24	0.336	12.723*** (4, 364)	54.126*** (4, 178.684)	C1, C2 < C3, C4 < C5
C2	0.94	1.16				
C3	2.49	1.76				
C4	2.32	1.96				
C5	4.13	1.69				
CDS-12						
C1	25.70	8.26	0.511	4.459** (4, 353)	94.887*** (4, 174.805)	C1 < C2 < C3, C4 < C5
C2	29.90	7.42				
C3	39.22	6.41				
C4	38.92	6.34				
C5	46.02	5.33				
NCD						
C1	5.71	3.47	0.267	2.514* (4, 363)	34.423*** (4, 179.399)	C1, C2 < C3, C4 < C5
C2	7.33	4.40				
C3	10.84	5.40				
C4	10.42	6.32				
C5	15.19	7.04				

CDS-12 = Cigarette Dependence Scale; FTND = Fagerström Test of Nicotine Dependence.

* $p < .05$; ** $p < .01$; *** $p < .001$.

A noteworthy result was that PDM and SDM were highly correlated, thus introducing a problem of discriminant validity. Similar correlations were observed in studies using WISDM¹² and B-WISDM,²⁰ but the two constructs were considered separate at a theoretical level. PDM represents the core of tobacco dependence because it measures the most important aspects of dependence as defined by the *DSM-IV* and *ICD-10*. This statement is consistent with results that PDM overcomes (or better predicts) other measures of tobacco dependence than SDM.^{10,12} These studies, together with our results that did not support a one-factor second-order model, conclude that PDM and SDM are two different constructs. Although PDM and SDM could exist at a theoretical level, our results suggested that the B-WISDM may not represent the best instrument to account for them or, at least, not with a variable-centered approach.

Regarding internal consistency, the Cronbach's alpha values were all satisfactory, except a low value for cue exposure/associative processes. These results were consistent with previous studies.^{18–20} The reliability problem of cue exposure could be due to the items included in this subscale. Ma et al. replicated the identical item selection process used by Smith et al. to reduce the length of the WISDM and observed some discrepancies between the two selections, in particular for the SDM scales, including cue exposure/associative processes. The discrepancies could be due to sample characteristics, such as cultural factors, which might explain our results.

The second aim of this study was to typify smokers based on their motives to smoke. Five clusters of smokers were identified. Two main groups were detected from an analysis of the dependence motive patterns of the clusters. These groups differed qualitatively, mainly in the relationship between PDMs and SDMs: whereas Group B had similar levels for the subscales included in both constructs, Group A tended to have higher levels of SDMs than PDMs. This result was consistent with the study of Piper et al.,¹⁵ in which PDM and SDM were emphasized for the first time with a person-centered analysis. The authors identified five motivational profiles using the WISDM. In addition to using a different questionnaire, a comparison with our study is complex because we considered only nine factors. However, some similarities can be emphasized.

First, in both studies, the motivational profiles were fairly parallel across clusters and it is noteworthy that parallelism could be detected particularly toward PDM. The relationship between the PDMs remained nearly identical in each cluster, whereas the relationship between SDMs changed according to the two qualitative groups identified. This result suggests that PDMs only varies in a quantitative manner and enhances the interpretation that PDM represents the core of smoking dependence. This is consistent with other studies that used different measures of dependence (such as FTND and *DSM-IV* criteria) to investigate smokers' phenotype.^{54,55} In these studies, smokers' classes differed each other only in a quantitative way, according to their dependence severity. Second, Piper et al.¹⁵ and Piasecki et al.¹² observed that other smoking dependence indices were predicted by PDM but not (or less) by SDM. This result also occurred in our study because differences in the FTND, CDS-12, and NCD appeared to mainly depend on PDM. When the PDM patterns of two clusters were close (or overlapped), differences were not detected. These considerations indicated that the dependence tests essentially measure the PDM factors.

Concerning SDM, one factor is notable, namely social/environmental goods that mainly characterized two of the identified clusters. This result could be due to sample characteristics. Many studies have demonstrated the influence of social variables in beginning and maintaining smoking behavior, particularly in young individuals,^{56–58} and our sample was composed of young smokers. Our analysis noted that there were young smoker typologies for whom social motive was particularly important in determining smoking behavior. This result could be useful to select an appropriate intervention to help these individuals quit smoking. For instance, a treatment focused on social habits that teaches them to cope with these situations without smoking might be more appropriate and efficient than a treatment based on the use of bupropion or varenicline. This kind of treatment could be useful for individuals in Cluster 2, but not for individuals in Cluster 3: although the level of social motive was identical in both profiles, Cluster 3 had a higher dependence than Cluster 2, and people in this cluster might also

need a pharmacological help. The importance of social motives was also emphasized by other authors. Through a cluster analysis, Best and Hakstian² found that some smokers' groups were particularly characterized by a high smoking rate in social situations. Shiffman et al.,⁵⁹ using both the McKennell's⁵ and the Russell's⁷ framework to investigate smoking motives, found that social factor is one of the main endorsed motives, in particular for light smokers (that is consistent with our results).

In conclusion, the present study has demonstrated the usefulness of the B-WISDM in determining smoking motives in a sample of young Italian daily smokers, thus also confirming the distinction between PDM and SDM in this questionnaire. Moreover, our results indicated five smoking motivational profiles of young smokers that were characterized by different smoking behaviors and dependence. Study limitations mainly concern the absence of other measures to validate our results. First, we did not use a biological measure of smoking dependence. Secondly, a more ecological method would have been useful to assess the truthfulness of our results. For instance, an experience sampling method that assesses the identical smoking motives of the B-WISDM could be useful in validate clusters with an online measure of behavior, deepen the knowledge of the clusters, and result in further smoking motive profiles. A last limitation concerns data analysis. Cluster analysis assumes the perfect classification of observations into clusters and this could represent a problem for the following ANOVAs. Moreover, CFA and cluster analysis were performed on the same sample. As results of cluster analysis are strongly dependent on the sample on which it is performed, further studies are needed to confirm our typologies. Nevertheless, this study represents an initial step in assessing smoking motivational factors among young smokers. Further studies are necessary to assess whether these motivational profiles yield different outcomes to different interventions to help individuals quit and assess whether these profiles can be observed in an older population and different cultural contexts.

Declaration of Interests

None declared.

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