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Abstract

Work has a crucial role in individuals' productivity, social life and psychological wellbeing. Despite various definitions of work addiction in the literature, the number of psychometrically reliable instruments is limited. The aim of this study was to psychometrically test and revise the factor structure of the Work Addiction Risk Test (WART), one of the most widely used instruments assessing work addiction. The full version of the WART (Robinson, Post, & Khakee, 1992) was assessed using a nationally representative sample of Hungary (N = 2710). To increase validity, the analyses were conducted among individuals who worked at least 40 hours a week (N = 1286, 43% women, mean age = 38.9 years, SD = 10.8). Using confirmatory factor analysis, the originally proposed four- and five-factor solutions did not have adequate model fit indices. Thus, the sample was randomly divided into two sub-samples. Exploratory factor analysis conducted in the first half of the sample supported a four-factor solution, which was confirmed in the other half of the sample. The Work Addiction Risk Test Revised (WART-R) comprises 17 items and four factors (i.e., Over-commitment, Impatience, Hard-working, and Salience). As a conclusion, the WART-R is suitable to be used as an indicator work addiction based on clinically relevant symptom dimensions.

Keywords: Work Addiction, Work Addiction Risk Test, WART-R, scale development, workaholism

Introduction

Work has a central role in the life of adult individuals. In addition to spending daily time in a productive manner, work has a major impact on psychological wellbeing and has strong relationship with the quality of social life [1]. For instance, unemployment and job insecurity have negative effects on health [2], and long working hours can negatively influence physical and mental health leading to work-family conflicts [3]. Furthermore, attitudes to work have a great influence on physical and mental wellbeing [4]. Several studies have found that a low level of job satisfaction is strongly associated with burnout, depression, anxiety, and low level of self-esteem [5]. Although there has been an increasing number of studies exploring the problem of excessive work and work addiction over the past two decades, contrary to other behavioral addictions, there are many unanswered questions related to the psychology of work addiction [6]. For instance, only a few studies have investigated the psychological antecedents of work addiction in a longitudinal context (see review by Clark et al [7]). Consequently, the personality factors involved in the development of work addiction are not clear. At the same time, there is also a very poor knowledge about interventions and treatment of excessive and compulsive working [8]. Although there are some largescale studies examining work addiction [9-11] many other papers are based on clinical observations and anecdotal case studies [12-14].

The first description of work addiction emphasized the uncontrollable need for work that interferes with one's health and happiness [15, 16]. Oates suggested the term "workaholism" for this behavior because he considered work addiction to be a disorder similar to alcoholism [17, 18]. However, the terms 'workaholism' and 'work addiction' have been used interchangeably in the literature. In the present study, only the term 'work addiction' is used because this term is theoretically based on the core addiction literature whereas workaholism typically refers to excessive working independently from its negative or positive consequences [6]. During the past four decades, several definition and

conceptualization have been developed relating to work addiction [7]. As Clark et al [7] emphasized, these can differentiate between theories regarding work addiction as an addiction [19, 20], as a behavioral pattern [21], as a set of attitudes toward work [22], and as a syndrome [23]. In most of the definitions, there are several commonalities between work addiction and other addictions (e.g., substance use, alcohol use, gambling, etc.) and work addiction has many features that are also common with obsessive-compulsive disorder [21, 24-25].

Although several authors have emphasized the importance of obsessive thinking in work addiction in their theoretical modesl [13, 15, 26, 27], very few studies have empirically explored the association between obsessive-compulsiveness and work addiction. Both Mudrack [28] and Aziz, Wuensch & Brandon [29] found a significant positive (but low) correlation between the two constructs, and Butucescu and Uscatescu [30] also reported a significant positive (but moderate) correlation between obsessiveness and the level of work addiction. In a more recent study, Andreassen et al [31] examined the relationships between work addiction and symptoms of psychiatric disorders among a nationally representative sample of Norwegian employees. They found that psychiatric symptoms (as ADHD, OCD, anxiety, and depression) explained only 17.0% of the variance of work addiction. The findings of these few studies suggest that although there are common factors in work addiction and obsessive-compulsiveness, the two disorders cannot be considered as being the same. Individuals with work addiction are characterized by some other features and symptoms which are not elements of obsessive-compulsiveness. Similar to other addictive behaviors, individuals with work addiction experience a craving for work, the presence of withdrawal symptoms, and elevated level of tolerance over time [20], hence more work is needed to reach the same psychological effect [32]. Although extensive involvement with work is connected to high quality job performance, feelings of empowerment and positive affect [33. 34], work addiction is related to several psychological problems. According to Porter [24], work

addicted individuals are characterized by loss of interest, low self-esteem, rigid thinking, withdrawal symptoms concerning work, an elevated level of tolerance, and denial of the disorder. Such individuals often use work for the repression of negative feelings and use the external reinforcement (i.e., money) to compensate for their negatively perceived self. At the same time, the attention of individuals with work addiction is focused only on their own performance, and they tend to ignore others. As a consequence, they are usually unable to establish satisfactory relationships or cooperate with their own colleagues. Moreover, they often project their perfectionistic expectations onto their colleagues. They find the lack of work stressful. Individuals with work addiction rarely have insight into their disorder, and they tend to rationalize the excessive work as something that they do for their families. There are only a very few studies on treatment of work addiction [35, 36] and for a better understanding of the problem, more clinical trials are needed.

Robinson [32] describes work addiction as a progressive disorder characterized by exaggerated expectancies towards self, compulsive overwork, incapability of regulating working habits (more specifically over-regulation), excessive immersion into work, loss of intimate relationships, and overall deterioration of physical and mental wellbeing. Individuals with work addiction suffer from more health problems and experience more stress during their work than others [22]. It has also been found that work addiction is highly comorbid with anxiety disorders, depression [37] and other addictions [38]. Clark, Lelchook and Taylor [39] found that perfectionism and narcissism are strongly related to work addiction.

Work addiction appears to be more frequent in countries in Western Europe and the US, where higher emphasis is placed on individual performance [40]. Moreover, work addiction is typically present among intellectual professionals from the middle and high classes [40]. Approximately 30% of individuals working in the USA and Canada admit to having work addiction and 53% of them work 60 hours or more per week [40]. However, reviews of the empirical literature have estimated the prevalence of work addiction to be

approximately 8-10% [9, 17, 41]. The prevalence of work addiction is the highest among those with high salaries [42].

Arguably, measures of work addiction are just as heterogeneous as the definition of the construct. The Workaholism Battery (WorkBAT) was developed by Spence and Robbins in 1992 is the most popular instrument in that it has been used in approximately 500 studies according to a relatively recent review [17]. However, the WorkBAT is largely atheoretical and is not based on the core components of addiction such as tolerance, withdrawal, conflict, salience, mood modification, and relapse [43]. The Work Addiction Risk Test (WART) has been used in approximately 50 studies. Items are based on expert consensus and were derived from alcohol use research. There are two other instruments, the Dutch Work Addiction Scale (DUWAS) [44] which is based on the WorkBAT and WART, and the Bergen Work Addiction Scale (BWAS) [10] which is based on components model of addiction [43, 46]. However, the WART is the only instrument which was designed to be used in clinical work. However, in the general population, the scale is only suitable for the screening the risk of work addiction. To make a reliable diagnosis of work addiction, a clinical interview by a trained practitioner is needed. Contrary to the other well-known work addictions scales, there is no consensus concerning the factor structure of WART. In addition to the single factor solution, Flowers and Robinson [47] also suggested a five-factor structure (i.e., Compulsive tendency, Control, Impaired Communication/Self-absorption and Self-worth, and Inability to delegate). In another study, Robinson, Flowers and Carroll [48] used only four out of the fives factors omitting “Inability to Delegate”. Furthermore, to be informative for clinical use, Robinson [32] defined cut-off scores for determining low risk, middle risk, and high risk of work addiction. However, the scoring appears to be arbitrary, and has never been tested with psychometric methods. There have also been some other studies testing the factor structure of WART (and these are summarized in Table 1).

Table 1

Although Taris, Schaufeli, and Verhoeven [50] confirmed the five-factor solution of WART on a Dutch sample, other authors in different countries (USA and Norway) have found different factor structures to the original [39, 51]. Clark et al [39] utilized a convenience sample of students who had a job and they verified only three factors (i.e., Impatience, Compulsion to work, and Polychronic Control). A few years later, Andreassen et al. [51] also failed to replicate the original five-factor solution. However, they asked a convenience sample of Norwegian employees, and not students. Although they did not name the factors derived from their exploratory factor analysis, they used the following categories to describe them: Overwork, Control/Perfection, Intimacy/Work-family interface, and Impatience. According to these previous studies, the factor structure of WART is not consistent, and the differences may originate not only from the different cultures tested but also from different samples. The present authors assume that asking people who do not have a job is conceptually and methodologically problematic and that psychometric studies concerning work addiction should focus on participants that are actually working.

Despite of the ambiguity of its factor structure, the WART has proved to be a promising instrument for the assessment of work addiction. However, to date, it has only been applied among convenience samples (which means that these studies simply involved those participants who were the easiest to recruit), and participants were not representative of the entire population (see Table 1). Using a sample representing the entire population means that all the working areas and jobs can be explored. It also means that the level of education, the type of work, and/or the individual's position within the workplaces do not generate biases in assessing work addiction. The lack of previous representative studies concerning work addiction provides a plausible reason for the lack of consensus concerning the WART's factor structure and measurement model. Given that the WART is a frequently used, psychometrically valid instrument with clinical relevance, it is important to explore the

underlying factor structure. Thus, the aim of the present study was to analyze the factor structure of WART and its construct validity in a large nationally representative sample. The other aims were to define a cut-off score for high risk of work addiction, and to estimate the prevalence of high risk of work addiction. The third aim was to validate the Hungarian translation of WART.

Methods

Participants and Procedure

Work addiction was assessed within the framework of the *National Survey on Addiction Problems in Hungary* (NSAPH) [52]. This national survey assessed psychoactive substance use (i.e., tobacco smoking, alcohol, and other substance use) as well as various behavioral addictions (e.g., pathological gambling, internet addiction, compulsive buying, eating disorders, and exercise dependence). The target population of the survey was the total population of Hungary between the ages of 18 and 64 years (approximately 6.7 million individuals). The sampling frame consisted of the whole resident population with a valid address, according to the register of the Central Office for Administrative and Electronic Public Services on January 1, 2006. Data collection was executed on a total sample of 3,183 individuals, stratified according to geographical location, degree of urbanization and age (overall 186 strata) representative of the sampling frame. The Institutional Review Board approved the study design and the research followed the tenets of the Declaration of Helsinki.

Participants were first contacted by phone to invite them to take part in the study. If they agreed to participate, the interviewers visited them personally. The interviewers provided detailed information about the study to the participants. All the participants gave informed consent before starting the interview. Participants were surveyed using the so-called “mixed-method” via personal visits. Questions regarding background variables and introductory

questions referring to specific disorders were asked in the course of face-to-face interviews, while symptom scales, including the Work Addiction Risk Test [53, 54] were applied using self-administered paper-and-pencil questionnaires. These questionnaires were returned to the research team in a closed envelope to ensure confidentiality. The net sample size was 2,710 (response rate: 85.1%). The ratio of samples belonging to each stratum was adjusted to the characteristics of the sampling frame by means of a weighted matrix for each stratum category [55]. The weights applied had normal distribution (SD = 0.228; Skewness = 0.639; Std. Error of Skewness = 0.047; Kurtosis = 2.397; Std. Error of Kurtosis = 0.094). These participants were asked to complete the WART, and those who worked at least 40 hours a week comprised the participants in the present study. This subsample comprised 1,286 individuals (731 males and 555 females), and the mean age was 38.9 years (SD=10.8, youngest: 18 years, oldest: 63 years). Approximately one-fifth had at least graduated from colleague or university (22.2%), 25.2% completed vocational training, and 13.9% secondary school. The remaining participants did not complete secondary school (38.5%). The average working hours per week was 43.32, although most participants worked 40 hours a week (65.6%). Five percent of the sample worked more than 50 hours a week. Regarding the field of work, participants worked in industry (22.1%), trade (15.8%), education or science (7.9%), health care (7.3%), tourism (5%), or was a civil servant (7%). Most of them worked in the private sector (67.4%), and a quarter in a government-maintained sector. Only 10.7% reported that their father, and 9.3% that their mother had a college or university degree. Most participants were married (59.9%), and 18.8% were single. Overall, 50.5% had a monthly net income below the national the average, and the rest had an above-average income. Despite this, 20.3% believed to live above, and 11.9% below the average, whereas 67.2% perceived their income as “average”.

Measures

The Work Addiction Risk Test was used to assess work addiction. The original test was developed as a self-administering instrument to screen for tendencies for work addiction [32, 49, 54]. The 25 items are rated between 1 (never true) to 4 (always true). Higher scores indicate higher risk of work addiction. Previous studies support the validity [49, 54, 56, 57] and reliability [58, 59] of WART. Based on the data from 151 respondents, the WART yielded good reliability and test-retest correlation coefficient [49]. In another study [59], based on the analysis of 442 respondents, split-half reliability of the WART was .85. The WART has adequate content validity, based on a sample of 50 working laymen [57]. Furthermore, psychotherapists were able to select the 25 original work addiction-related items out of 35 items with an accuracy of 89% [59]. A review by experts suggested four subscales: Compulsive Tendency, Control, Impaired Communication/Self-absorption, and Self-worth. As we mentioned in the Introduction, there are several versions for the factor structure of the scale. One-factor, three-factor, four-factor, and five-factor solution models have been published, but all of these studies recruited convenience samples (see Table 1).

The questionnaire was translated from English to Hungarian by bilingual experts. Both translators were familiar with the terminology of the area and one of the translators was a native English speaker. Inconsistencies were discussed. In the second step, the instrument was back-translated to English by another independent translator, another native speaker of English, unfamiliar with the initial questionnaire. Finally, all inconsistencies were discussed and resolved.

The Symptom Checklist 90-Revised (SCL-90-R) [60, 61] was used for assessing psychological symptoms. The SCL-90-R is a 90-item self-report inventory designed to reflect psychological symptom patterns of psychiatric and medical patients. Each item of the questionnaire is rated on a 5-point scale of distress from 0 (not at all) to 4 (very much). Although the SCL-90-R comprises nine primary symptom dimensions, previous research noted a strong mental distress general symptom that explained the large variance of each dimension with the

exception of hostility scale which has relevant symptom specific variance [62, 63]. Apart from the general factor, only one specific symptom factor (i.e., hostility) had a relatively large specific explained variance. Consequently, the hostility scale was applied in the present analysis.

Statistical Analysis

In the first step, confirmatory factor analysis (CFA) was applied to test the single-, the four-factor, and the five-factor measurement model of the WART. The five-factor solution included Compulsive Tendency (Items 3, 5, 6, 7, 8, 15, 18, 19, and 20), Control (Items 2, 4, 11, 12, 16, 17, and 22), Impaired Communication/Self-absorption (Items 13, 21, 23, 24, and 25), and Self-worth (Items 9 and 10), and Inability to delegate (Item 1), and Item 14 was excluded as per the original version [47]. Correlating factors were implied in the estimation of the five-factor model. The maximum likelihood estimation method (MLR recommended by Brown [64] and Muthén & Muthén [65] was applied that is robust to non-normal distribution. To test the model fit, multiple indices were selected, namely chi-square (χ^2) value, root-mean-squared error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI). Satisfactory degree of fit requires that CFI and TLI are larger than .95. An RMSEA value below .05 indicates excellent fit, a value < .08 indicates adequate fit, and a value above .10 signifies poor fit. Closeness of model fit using RMSEA (CFit of RMSEA) is a statistical test [66], which evaluates the statistical deviation of RMSEA from the value 0.05. Nonsignificant probability values ($p > .05$) indicate good model fit, though some methodologists would require larger values such as $p > .50$ [64].

In the second step—and because the first CFAs did not support the previously proposed measurement models—a two-step procedure was followed which required two non-overlapping groups. Therefore, the sample was randomly split into two approximately equally sized subsamples. The two samples were created with an SPSS procedure using a random

number generator. In the first group, 48.8% of the sample was selected, and the remaining 51.2% were selected in the second group.

One subsample was used for scale construction (exploratory sample), whereas the remaining subsample was used for cross-validation (confirmatory sample). For scale construction, exploratory factor analysis (EFA) was performed with MLR estimation method and geomin rotation. The exploratory sample comprised 628 individuals (359 males and 269 females) with a mean age of 38.2 years (SD = 10.8), whereas the confirmatory sample comprised 658 individuals (372 males and 286 females) with mean age of 38.9 years (SD = 10.7). The CFA was also performed with MLR estimation method, and modification indices were also examined to identify any local misfit. All analyses were performed with SPSS 17.0 and Mplus 8.1 [65].

A latent profile analysis was applied to identify subtypes of workers exhibiting similar patterns of the dimensions of risk for work addiction. Therefore, a latent profile analysis was performed with one to six classes to determine how many types could be identified with the Hungarian version of WART. The latent profile analysis is a latent variable analysis with a categorical latent variable — in this case the different risk groups— and continuous manifest indicators, such as the four dimensions of WART. In the process of determining the number of latent classes, the present study used the sample size adjusted Bayesian information criteria parsimony index, the minimization of cross-classification probabilities, entropy, and the interpretability of classes. In the final determination of the number of classes, the likelihood-ratio difference test (Lo-Mendel-Rubin adjusted likelihood-ratio test [LRT]) was also used, which compares the estimated model with a model having one less class than the estimated model [65]. A low p value ($p<.05$) indicates that the model with one fewer class is rejected in favor of the estimated model. To validate the latent class model, the classes in age, gender, work hours, mental distress, and hostility scores were also compared.

To determine a cutoff score for the high risk of work addiction and knowing that there is no 'gold standard' to diagnose work addiction, the present study used the high risk group as a symptomatic group, and all other group as a nonsymptomatic group. The sensitivity and specificity values were calculated for several WART cut points. Sensitivity (i.e., the proportion of true positives that are correctly identified by the WART score) and specificity (i.e., the proportion of true negatives that are correctly identified by WART score) were defined based in the suggested by Glaros and Kline [67]. To explore the probability that the given cutoff score would give the correct "diagnosis", the positive predictive values, the negative predictive values, and the accuracy values were calculated. Positive predictive value (PPV) is defined as the proportion of participants with positive test results who are correctly diagnosed [67]. Negative predictive value (NPV) is defined as the proportion of individuals with negative test results who are correctly diagnosed [67].

Results

Confirmatory Factor Analyses of the WART Factor Structures

Confirmatory factor analyses were performed on the previously proposed models of the WART. The fit indices of the one-, the four-, and five-factor solution showed inadequate fit to the data. The one-factor solution fitted the least: $\chi^2 = 2249$, df = 275, $p < .001$; CFI = .750; TLI = .730; RMSEA = .075, CFit < .001. The degree of fit of four-factor model was also not acceptable ($\chi^2 = 1736$, df = 224, $p < .001$; CFI = .794; TLI = .767; RMSEA = .072, CFit < .001). The same was true of the five-factor model ($\chi^2 = 1409.4$, df = 243, $p < .001$; CFI = .85; TLI = .83; RMSEA = .061, CFit < .001). Instead of extensively searching for the sources of misfit in modification indices, it was decided that explorative factor analysis would be most appropriate.

Exploratory Factor Analysis

An exploratory factor analysis (EFA) was performed with MLR and GEOMIN rotation to evaluate the factor structure of 25 items on Sample 1 (N = 628). Acceptability of the factor solution was based on goodness of fit index (RMSEA < .080, Cfit > .05), the interpretability of the solution, and salient factor loadings (> .30). The present study examined 1-, 2-, 3-, 4-, and 5-factor solutions. RMSEA values were .072 (Cfit < .0001) for the one-factor solution; .066 (Cfit < .001) for the two-factor solution; .053 (Cfit < .141) for the three-factor solution; .044 (Cfit = .958) for the four-factor solution, and .027 (Cfit=1.00) for the five-factor solution. For statistical reasons and the interpretability of the factor structure, the four-factor solution was retained (χ^2=459.1, df = 206, p < .0001; CFI = .933; TLI = .902, SRMR=0.031). The results of the EFA are reported in Table 2. In order to select items for further analysis, the following rules were applied: First, items that had factor loadings larger than 0.40 were retained. Second, items with salient cross loadings (> .30) were excluded [68]. Consequently, according to the predetermined criteria, eight items were excluded (Items 8, 10, 11, 13, 14, 21, 22, 25) from further analyses. Similarly to previous results [37], five out of seven items of the Impatience factor remained (Items 2, 4, 12, 16, 17) in the new structure. However, Items 11 and 22 both had cross-loadings and thus they were not included in the model. Items 1, 9, and 18 represent Hard working, whereas Items 15, 19, 20, 23 and 24 represented the Salience factor. Over-commitment factor comprised Items 3, 5, 6 and 7. The correlations between factors were moderate and ranged between .16 and .50 (see Table 2). This new, four-factor model comprised 17 items and was re-named the Work Addiction Risk Test Revised (WART-R).

Table 2.

Testing the new Measurement Model: Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) with MLR estimation was applied to confirm the result of the previous exploratory factor analysis on an independent subsample. This model provided adequate fit to the data ($\chi^2 = 259.6$, df = 98, $p < .001$; RMSEA = .050, Cfit = .482; CFI = .936; TLI = .922). Via inspection of the modification indices, it was noted that freeing the error covariance between Items 20 and 23 increased the model fit significantly, thus the content of these items was further examined. These two items had very similar meaning, therefore a model was estimated freeing the error covariance between Item 20 and Item 23. The degree of model fit increased ($\chi^2 = 229.3$, df = 97, $p < .001$; RMSEA = .047, CFit = .827; CFI = .948; TLI = .935) and the correlation between the error terms was .37. The new factor structure and factor loadings are presented in Table 3. All factor loadings are near to or above .40, and loadings ranged between .39 and .73.

Table 3

Covariates of the factors of WART-R: Confirmatory factor analysis with covariates

The correlations between the four new factors and work-related factors and mental health indicators were estimated (see Table 4). Age correlated with hard working and salience factors. Gender was related with the over-commitment factor only. The amount of time spent working was significantly associated with all factors, indicating that those workers who report more working hours tend to score higher on all dimensions. Both mental health symptoms and hostility score were also related to all dimensions. However, the strength of the associations vary, and the strongest associations were observed with the impatience factor. The multivariate analysis showed that over-commitment was related with gender and the amount of time spent working. The impatience factor was associated with age and hostility, and hard-working factors were associated with age, gender, and the amount of time spent working. Finally, the salience factor was related to age, the amount of time spent working, and mental health symptoms.

Table 4

Person-oriented analysis: Latent classes of work addiction risk

To identify the latent classes of work addiction risk, a latent profile analysis was performed with all four dimensions of the Hungarian version of WART. Each dimension was used as an observed score. One to six class solutions were estimated. The information-based criteria and entropy of each solution is presented in Table 5. The Akaike information criteria (AIC), sample-size adjusted Bayesian information criteria (ssaBIC) declined as more latent classes were added. However, a leveling-off after the four-latent-class solution was noted. Based on entropy, the three- and four-latent-class solutions reached the maximum level. Supporting the results of LMR test, the four-latent-class solution was selected. The profile plot of the classes is presented in Figure 1. The most prevalent class (N=614; 47.9%) is the hard-working medium risk group; the second most prevalent class is the hard-working low risk group type (N=468; 36.5%). The hard-working high-risk type was less prevalent than the previous two groups (N=119; 9.3%). Finally, a small group with low involvement in work was also identified (N=82; 6.4%).

Table 5 and Figure1

The differences of latent classes in work related variables and mental health indicators were also examined. A new 3-step procedure implemented in Mplus 8.1 was performed which took into account the probabilistic nature of class membership. The four groups did not differ statistically in gender distribution. The hard-working high-risk group was significantly older and reported more working hours than the other three groups. Hard-working medium and high-risk groups showed elevated level of mental distress and hostility scores compared to other two groups (see Table 6).

Table 6

Using the hard-working high-risk group as an index group, the sensitivity, specificity, the positive and negative predictive values, and accuracy were calculated at several cut-off points (see Table 7) to establish the most optimal thresholds. A cut-off at 51 and 52 resulted in high accuracy, but a cut-off at 51 (out of 68) yielded the acceptable sensitivity (90% in this sample) with excellent specificity (99%).

Table 7

Discussion

Out of the originally proposed one-, four- and five-factor models of the Work Addiction Risk Test (WART), none showed satisfactory fit on a nationally representative sample of individuals who worked at least 40 hours a week. Therefore, a more robust factor-structure was developed for the revised instrument. The best model fit was observed with four factors (i.e., Over-commitment, Impatience, Hard-working, and Salience) comprising 17 items. Further analysis confirmed this model on an independent sample. The revised instrument with the new structure was renamed the Work Addiction Risk Test Revised (WART-R). The content of the four factors only partially resembled the original four-factor model proposed by Robinson et al [48], and had many similarities with measures of other problematic work behaviors.

The first factor, *Over-commitment*, compares to "Compulsive tendency" which was identified as the first factor in the original five-factor solution [47, 50]. This factor refers to multi-tasking and being pressed to work. Some authors argue that over-commitment in sports may lead to injuries and eating disorders and therefore acts against performance in the long-term [69, 70]. This is in line with one of the most prominent features of work addiction that despite longer working hours, productivity does not increase [71,72,73]. However, this factor was not related with mental health indicators in a multivariate analysis. This indicates that over-commitment does not specifically co-vary with mental health problems. The second

factor, *Impatience*, refers to frustration over loss of control and unrealistically high expectations towards the self and others and is similar to the original "Control" factor. Impatience resembles impulsivity, specifically the inability to delay gratification which is a major factor in the development and maintenance of addictive behaviors [74,75]. The content of this factor is similar to the Unpleasantness factor of the Workaholism Analysis Questionnaire [76], but impatience and impulsivity are more emphasized in this second factor of the WART-R. The Impatience factor shared common variance with hostility highlighting a possible toxic element of work addiction. However, further research is needed to clarify the nature of this association. The initial third, fourth (in the four- and five-factor models), and fifth factor (in the five-factor model) were re-conceptualized as *Hard-working* (reflecting a strong identification with work and performance), and *Salience* (comprising five items which cover the narrowing of interests outside work). The result, especially the combination of these factors, led to the neglect of social relationships and recovery time. Unsurprisingly, the Salience factor is considered an important indicator of addiction, independently from other features of addictive behavior [43,77]. Salience was related to mental health symptoms and hard-working but not in the multivariate analysis. However, it is not clear that neglecting social relationships leads to increased mental health symptoms or that workers suffering from these symptoms may be prone to choosing work rather than being with family and friends. Furthermore, some items of the WART-R suggest a potential association between work addiction and perfectionism (e.g. Item 13 – "I get angry when people don't meet my standards of perfection"). Although the relationship between work addiction and perfectionism was not analyzed in this study, there are several studies that have examined this question. Among them, only three studies tested the association between perfectionism and the WART. Bovornusvakool et al. [78] found a moderate positive correlation with the overall score on the WART ($r = 0.52$; $p<.01$). Clark et al. (2010) number reference missing also assessed perfectionism but they presented the relationships between the three factors of the WART and

three subscales of a perfectionism scale. According to their results, 'Discrepancy' (assessing individuals' perceptions as failing to meet their personal standards for performance) showed the strongest (positive moderate) correlation with all the WART scales and its overall score. However, the more adaptive forms of perfectionism did not relate significantly to any of the WART subscales although 'Polychronic control' was lowly correlated. Taris et al [79] applied only the 'Compulsive tendencies' subscale of WART and they found a positive low correlation between this factor and 'Concern over mistakes' and 'Personal standards' factors of perfectionism. According to their mediation analyses, only the socially prescribed form of perfectionism (concern over mistakes) predicted work addiction and high standards did not. These results suggest that perfectionism (especially the socially prescribed and the maladaptive forms) play a role in work addiction but only in a low or moderate way. These associations represent both good convergent and divergent validity of WART. In future research, discriminant validity of the WART-R should be tested, and more accepted multidimensional perfectionism scales need to be used (e.g. Hewitt & Flett [80]).

WART-R is similar to existing scales in many ways. For example, Over-commitment partially overlaps with "Work involvement", and Hard working with "Drive" in the Workaholism Battery (WorkBAT) [22]. However, whilst the WorkBAT contains a scale to assess satisfaction (Enjoyment), which is a reversed indicator of work addiction, the WART-R includes Impatience and Salience which are clearly indicators of problematic work behavior. Another measure, the Dutch Work Addiction Scale (DUWAS) was developed by Schaufeli, Shimazu, and Taris [44]. Here, Over-commitment is labelled as Working Excessively, whereas Hard working (and partially Salience) are similar to Working Compulsively in DUWAS. Finally, the Bergen Work Addiction Scale (BWAS) developed by Andreassen et al. [10] is based on the six core addiction criteria proposed by Griffiths [43] and therefore only Salience overlaps with WART-R. Other measures have received little empirical support or scientific attention [21].

One strength of the present study is the utilization of a nationally representative sample of individuals who had a current job. Compared to earlier studies examining the factor structure of WART, the present study asked working individuals in several different working areas, and the results were not biased by the answers of individuals who do not work.

Another strength of the present study was empirically testing the scoring of the WART. None of the previous studies have ever tested the original scoring technique [32] or developed and empirically tested any ranging for levels of work addiction. With this revised instrument, the present study identified four group of workers with a different level of risk for working addiction and a cutoff point (51 or above) was determined for high risk of work addiction. Approximately 9% of workers in the present study were characterized with (i) high overcommitment, (ii) hardworking with high frustration over loss of control, and (iii) unrealistically high expectations towards the self and others. This group of individuals works more hours and has the highest level of mental distress and hostility indicating a high risk of work addiction. Almost half of the workers showed a moderate degree of risk of unhealthy pattern of working behavior. This group also showed a sign of the elevated mental distress and increased hostility. A large proportion of workers rated themselves low on the four scales except for hard working. However, this group does not show any sign of mental distress similar to the final (low involvement in work) group.

The present study is not without its limitations. Despite the sample being nationally representative, the data were self-report and suffered from well-established biases (e.g., social desirability, memory recall, etc.). Furthermore, given that the sample included individuals who worked at least 40 hours per week, the sample did not include individuals who had recently lost their jobs. Furthermore, the newly developed scale should not to be used as a diagnostic tool. However, it might be of help to clinicians or counselors to gain a more accurate picture of work-related psychological status of their patients or an observed group of individuals. The most important future direction is to define an accurate cut-off point based on

clinical cases to identify those who are the most at risk of developing work addiction. Furthermore, future research should explore whether different sub-types of work addiction exist [39, 44] or that this assumption is a mere by-product of observing the same phenomena in different personality types.

In conclusion, the WART-R is a suitable instrument to be used as an indicator for work addiction based on clinically relevant symptoms. The four subscales (i.e., Over-commitment, Impatience, Hard-working, and Salience) related to previous findings on dimensions of problematic work behavior. Thus, it is hoped that the WART-R will be widely used as an instrument to identify individuals who suffer from clinically relevant symptoms of work addiction.

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