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The Role of Circadian Typology in the Relationship Between Perfectionism and Workaholism

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The Role of Circadian Typology in the Relationship Between Perfectionistic Concerns and Workaholism

ABSTRACT

Workaholism is a work-related addiction, and the study of its antecedents has a strong individual and social impact. Several studies reported high trait perfectionism in individuals exhibiting workaholism. Although the relationship between perfectionism and workaholism is quite consistent in the literature, it is not yet clear which biological underlying mechanisms might explain this relationship. From a chronopsychological perspective, it has been widely demonstrated that evening-type individuals are more prone to develop addictive behaviour. In the present study, we investigated, for the first time, the role of circadian typology in the relationship between perfectionistic concerns and workaholism. A group of Italian workers (N =369; 60.70% females; mean age of 38.60 years) took part in a survey. Participants filled in the Bergen Work Addiction Scale (for workaholism), the Morningness-Eveningness Questionnaire (for circadian typology), and the Short Almost-Perfect Scale (for perfectionism). In addition to age, we controlled for workload using the Job Content Questionnaire. Beyond the confirmation of the relationship between perfectionism and workaholism, we found that in high perfectionistic individuals, evening-types reported higher score in Bergen Work Addiction Scale. Based on these findings, limitations and suggestions for future research are discussed.

Keywords: Morningness-eveningness; Workaholism; Addiction; Perfectionism; Personality; Moderation Analysis.

Introduction

In recent decades, as a result of economic and technological changes, there has been a redefinition of the work scenario. The increase in job uncertainty and job demands has pushed many employees to deal with tight work rhythms, fixed deadlines, and insufficient time to perform their tasks (Giunchi et al. 2016; Van Wijhe et al. 2013). In addition, the increasing use of mobile devices (e.g., laptops, smartphones) as a work tool, and the resulting 24/7 availability may lead employees to develop difficulty in disengaging from work, **thereby** reducing **their** time for recovery (Derks et al. 2014). This culture of overwork has contributed to the spread of workaholism, a term that **describes** the individual tendency to work excessively and compulsively (Schaufeli et al. 2008). Workaholic employees are "*persons whose need for work has become so excessive that it creates noticeable disturbance or interference with (their) bodily health, personal happiness, and interpersonal relations, and with (their) smooth social functioning*" (Oates 1971, **p.** 4).

The interest in workaholism has grown over the years among scholars, **prompting** different definitions of this phenomenon and **an increased focus** on its antecedents and outcomes (Clark et al. 2016; Loscalzo and Giannini 2017). For instance, from a clinical perspective, workaholism is conceptualized in terms of behavioural addiction, defining it as "*being overly concerned about work, to be driven by strong and uncontrollable work motivation, and to spend so much energy and effort into work that it impairs private relationships, spare-time activities and/or health*" (Andreassen et al. 2014a, **p.** 8). **According to** Snir and Harpaz (2012) **several personality antecedents**, such as Big Five model **traits** (Andreassen et al. 2014b; Clark et al. 2010), and Type A personality (Ng et al. 2007) **have been linked** to workaholism. It has been repeatedly found that perfectionism is a specific personality antecedent related to workaholism (Falco et al. 2014; Mazzetti et al. 2014; Stoeber et al. 2013).

The individual tendency of workaholics to spend much more time working than initially planned (Andreassen et al. 2012), including evenings and weekends, could lead them to be more prone to negative outcomes, such as job stress, burnout (Andreassen et al. 2018; Taris et al. 2005) and sleep-wake cycle disorders (Kubota et al. 2010, 2014; Salanova et al. 2016; Spagnoli et al. 2019). **Additionally**, it has been reported that perfectionism is highly correlated with sleep disturbances in both clinical and nonclinical populations (e.g., Azevedo et al. 2010; van de Laar et al. 2010). From chronobiological and chronopsychological perspectives, it has been observed that circadian typology or chronotype (i.e., morning-, neither-, and evening-types; Adan et al. 2012) is the most **notable** individual difference in sleep-wake regulation (Mongrain et al. 2004; Putilov 2017). Thus, it is possible to advance the idea that the sleep-wake disorders reported in workaholics could be influenced by circadian typology.

The possible role played by circadian typology could derive from studies associating this individual difference to personality (Tonetti 2011). In particular, a large number of studies have focused on the relationship between circadian typology and Costa and McCrae's (1992) Big Five model **traits** (extroversion, agreeableness, conscientiousness, neuroticism and openness). **Morning-type individuals tend to be more conscientious, precise, persistent, and hardworking (Hogben et al., 2007), whereas evening-types more extroverted, impulsive and prone to addiction (Adan et al., 2012).** **Considering** that perfectionistic concerns have been associated with neuroticism, low agreeableness and low extraversion, whereas perfectionistic striving was related to conscientiousness (Smith et al. 2019), it is possible that morningness-eveningness preference could be related to perfectionism and, in turn, to workaholism.

Despite these findings, little is known about the role of circadian typology in the growing field of workaholism. To fill this gap in the literature, we **propose** that circadian

typology may influence different domains of life such as the work context. Therefore, we focused on morningness-eveningness preference as an individual difference that, in combination with **another personality aspect, namely perfectionism**, might intensify workaholic behaviours. In line with these considerations, the present study aimed to shed light on the role of circadian typology, as **a notable** individual difference in chronopsychology, in the relationship between perfectionism and workaholism.

The Relationship between Perfectionistic Concerns and Workaholism

Many authors have found a strong relationship between workaholism and perfectionism (Clark et al. 2016; Ng et al. 2007; Spagnoli et al. 2021a; Stoeber and Damian 2016), **a personality disposition characterized by the tendency to set high personal standards for oneself and to critically evaluate one's adequacy in achieving those standards (Slaney et al. 2001)**.

Furthermore, it appears that perfectionism and workaholism share several aspects, such as high levels of perseverance and a tendency to be excessively self-critical (Dunkley et al. 2003). In support of this argument, recent studies have provided evidence of the predictive role of perfectionism on workaholism over time (Spagnoli et al. 2021a), and have analysed the relationship between perfectionism and workaholism through a cross-cultural perspective (Spagnoli et al. 2021b).

Although perfectionism is generally conceptualized as a multidimensional construct (Stoeber and Otto 2006), in recent years some scholars agree that perfectionism encompasses two main dimensions: perfectionistic strivings and perfectionistic concerns (Stoeber 2018). On one hand, perfectionistic strivings indicate the setting of high expectations regarding one's performance; on the other hand, perfectionistic concerns are characterized by the fear of making mistakes and being overly critical of one's

performance. Clark and colleagues (2010) have found that both perfectionistic strivings and perfectionistic concerns were significantly related to workaholism, highlighting how perfectionistic concerns could be a stronger driving force behind workaholic behaviours. In addition, a meta-analysis by Harari and colleagues (2018) and a recent longitudinal study by Spagnoli and colleagues (2021a) pointed out that the relationship between perfectionistic concerns and workaholism is much stronger than the relationship between perfectionistic strivings and workaholism. Thus, perfectionistic concerns seem to play a central role in the development of workaholism: the excessive self-criticism and the perceived gap between current and expected performance could lead employees to invest more energy and time in work and, consequently, be more prone to excessive and compulsive work (i.e., workaholism; Falco et al. 2017; Spagnoli et al. 2021a). Based on these findings, we expected a positive relationship between perfectionistic concerns and workaholism. Specifically, we hypothesized that perfectionistic concerns are positively related to workaholism (H1).

The Relationship between Circadian Typology and Workaholism

Circadian typology reflects the individual variation in diurnal preference for physical or mental performance (Adan et al. 2012). It is conceptualized as a continuum, with morning-type and evening-type at the two extremes and neither-type in the middle (Natale and Cicogna 2002). About 30-40% of the adult population belongs to one of the two extreme groups, while 60-70% of the adult population belongs to the neither-type group (Adan et al. 2012). Morning-types generally tend to go to bed and wake up early, and have the highest performance efficiency at the beginning of the day; in contrast, evening-types go to bed and wake up late, and have excellent performance at the end of the day (Fabbri et al. 2007, 2013; Taillard et al. 2004).

Significantly, evening-types, due to the mismatch between internal biological rhythms and socially imposed external rhythms, are more vulnerable to worse health conditions, such as higher rates of smoking, unhealthy diets, and later sleep times (Merikanto et al. 2013; Patterson et al. 2017). In addition, some studies have found that evening-types have a higher risk of developing addictive behaviours (Adan et al. 2012), such as alcohol and drug consumption (Gau et al. 2007; Prat and Adan 2011).

From the perspective of addictive behaviour (Andreassen et al. 2014a), only one study has examined the relationship between circadian typology and workaholism: in their longitudinal study, Andreassen and colleagues (2017) investigated the relationship between working conditions (e.g., job demands, control/decision latitude, social support at work), individual differences regarding sleep/wake variables (e.g., flexibility, languidity, morningness) and workaholism in a shift-working sample of nurses. Regarding morningness, no relationship was found with workaholism, supporting the idea that morningness might be a protective factor for health, whereas eveningness might be a risk factor (Adan et al. 2012).

However, one possible explanation for these results is that morning-types, having a greater capacity to work in the morning, may have difficulty coping with shift work. Andreassen and colleagues' study (2017) therefore open up new questions about a possible relationship between circadian typology and workaholism, primarily by extending this investigation to more categories of workers. On one hand, morning employees, who go to bed early and feel more active in the morning, might invest a lot of time and energy during working hours. On the other hand, evening employees, who go to bed late and feel more active in the evening, might continue to work from home especially during the evening hours, despite having performed their tasks during the day.

The present study aims to investigate, in an exploratory way, whether morningness-eveningness preference may be related to workaholism. In this respect, we hypothesized that extreme types (morning-types/evening-types) report higher levels of workaholism compared to neither-types (H2).

The Role of Circadian Typology in The Relationship Between Perfectionistic Concerns and Workaholism: A Possible Moderator?

There is **vast** literature showing the relationship between circadian typology and personality (e.g., Cavallera and Giudici 2008; Tonetti 2011). Based on the Big Five model by Costa and McCrae (1992), some studies have shown that morning-types report higher levels **of** conscientiousness, whereas evening-types report higher levels **of** neuroticism (DeYoung et al. 2007; Randler 2008, **2017**; Tonetti et al. 2009; **Tsaousis 2010**). Similar to evening-type, perfectionistic concerns seem to be positively related to neuroticism and negatively related to conscientiousness (Kim et al. 2015; Smith et al. 2019). However, little is known about the specific relationship between morningness-eveningness preference and perfectionistic concerns. Only a larger study by Natale and colleagues (2008) showed that eveningness preference corresponded to a higher perfectionism score. Given the assumption that perfectionistic concerns are related to workaholism (Harari et al. 2018; Spagnoli et al. 2021a), we aimed to investigate the role of circadian typology in this relationship. Hence, we expected an interaction between circadian typology and perfectionistic concerns on workaholism, with higher levels of perfectionistic concerns and extreme types (morning-type/evening-type) related to higher levels of workaholism, compared to neither-types, and lower levels of perfectionistic concerns (H3). In addition, we expected that circadian typology moderated the relationship between perfectionistic concerns and workaholism, such that extreme types (morning-type/evening-type) with

higher levels of perfectionistic concerns were related to higher levels of workaholism, whereas neither-types were related to lower levels of workaholism (H4).

In testing the proposed models, we introduced control variables such as workload and age. Regarding workload, a meta-analysis by Clark and colleagues (2016) showed that workload is one of the most predictive variables of workaholism. Whereas age has found to be negatively related to workaholism, with younger adults being more likely to be workaholics. (Andreassen et al. 2014b; Spagnoli et al. 2018). Furthermore, morningness preference is related to an older age, while eveningness preference is related to younger adults (Adan et al. 2012; Mecacci et al. 1986).

Materials and methods

Participants

A sample of 369 Italian workers (60.7% women and 39.3% men) from private and public organizations participated in the study (average working time: 40.60 h per week; S. D. = 14.98). Their age ranged from 19 to 65 years old (M = 38.6 years; S. D. = 11.53 years), and their educational level was distributed (65% bachelor or master's degree; 32% high school; and 3% middle school). Participants worked as entrepreneurs (32.2%), teachers (24.9%), freelancers/clerks (24.4%), healthcare workers (8.7%), educators (4.3%), managers (3%), and researchers (2.4%). However, only 366 workers completed the questionnaire. This sample of 366 was used to test the hypotheses of the present study.

Ethics Statement

The current study was in accordance with the standards of national laws on data treatment, complied by the University of Campania "Luigi Vanvitelli" (Italy). Since there

was no medical treatment or other procedures that could cause psychological or social discomfort to participants, who were all anonymous adult healthy participants, additional ethical approval was not required.

The research was conducted in accordance with international ethical standards (Portaluppi et al. 2010), and with the Helsinki Declaration (World Medical Association, 2001), as well as the data protection regulation of Italy (Legislative Decree No. 196/2003). Participation in the study was voluntary and not rewarded, and data collection and analysis were anonymous. A covering letter, attached to the questionnaire, provided information about the aims of the study, guarantees of anonymity, voluntary participation, data treatment, and instructions for filling out the questionnaire. When agreeing to fill out the questionnaire, all study participants provided their informed consent.

Measures

Workaholism

Workaholism was measured by the seven-item Bergen Work Addiction Scale (BWAS, Andreassen et al. 2012; Italian version by Molino et al. forthcoming), each of which investigates the seven core elements of addiction (i.e., salience, mood modification, tolerance, withdrawal, conflict, relapse, and problems). Examples of items were: "*worked so much that it has negatively influenced your health*" and "*spent much more time working than initially intended*". All items were rated on a five-point Likert scale from "never" to "always". In the present study, Cronbach's alpha for the scale was 0.78.

Circadian Typology

Circadian typology was measured with the Morningness-Eveningness Questionnaire (Horne and Östberg 1976, Italian version by Mecacci and Zani 1983). **The**

questionnaire is characterized by nineteen items in a mixed format (multiple-choice or open-ended), respondents are asked to indicate, for example, the time preference for physical and mental performance, or when they would prefer to wake up or start sleeping if they were free to plan their day/evening. The MEQ score ranges from 16 to 86, with scores above 58 identifying participants as morning types and scores below 42 as evening types. In the present study, Cronbach's alpha for the scale was 0.69.

Furthermore, the categorical circadian typology variable was computed into a 3-level variable, corresponding to (1) morning types, i.e., subjects with MEQ scores of 59-86, (2) neither type, i.e., subjects with MEQ scores of 42-58, and (3) evening types, i.e., subjects with MEQ scores of 16-41.

Perfectionistic concerns

The discrepancy subscale of the Short Almost-Perfect Scale (SAPS, Rice et al. 2014; Italian version for workers by Spagnoli et al. 2021b) was used to measure perfectionistic concerns. This subscale contains four items rated on a five-point scale from "strongly disagree" to "strongly agree". An example of an item is: "*I am hardly ever satisfied with my performance*". In the present study, Cronbach's alpha for the scale was 0.79.

According to Hayes (2017), the continuous variable of perfectionistic concerns was transformed into a 3-level categorical variable (low-moderate-high) corresponding to the 16th, 50th and 84th percentiles of the distribution, respectively.

Workload

Three of the five-item (e.g., "*I have to work very fast*") from the Job Content Questionnaire (JCQ, Karasek et al. 1998) **were** used to measure workload. Responses

were given on a five-point scale varying from “strongly disagree” to “strongly agree”. In the present study, Cronbach’s alpha for the scale was 0.67.

Data analysis

All data analyses were conducted with SPSS Statistics, ver. 21.0 (IBM, Armonk, NY, USA). Zero-order correlations (Pearson’s r) were performed to examine the associations between variables. An analysis of covariance (ANCOVA) was conducted with circadian typology (3 levels: morning-, neither- and evening-types) and perfectionistic concerns (3 levels: low, moderate and high) as independent variables, with age and workload as covariates, on BIAS score. Bonferroni post-hoc correction comparisons were performed in case of significant results. The significance level was set at $p < 0.05$. Then, to better examine the relationship between circadian typology and perfectionistic concerns on workaholism, we tested the moderation effect hypothesis through conditional process analysis, based on Ordinary Least Square (OLS) regression using a bootstrapping technique (Hayes 2017), a nonparametric resampling procedure that does not assume normality and involves the extraction of several thousand subsamples (5000, in our case) from a dataset. Specifically, in the current study, we used the conceptual model number 1 of Hayes’ templates (see Figure 1), to test whether circadian typology moderates the effects of perfectionistic concerns on workaholism, controlling for age and workload¹.

¹ We also conducted the same analyses adding another control variable as working hours per week. In summary, the main results were similar: for the ANCOVA, although evening-types reported higher levels of workaholism (2.74 ± 0.14) than neither-types (2.65 ± 0.05) and morning-types (2.52 ± 0.80), the circadian typology resulted not significant ($F_{2,353} = 1.23$, $p = 0.30$, $\eta^2_p = 0.01$). Furthermore, we found a significant interaction between circadian typology and perfectionistic concerns on BIAS score ($F_{4,353} = 2.64$, $p < 0.05$, $\eta^2_p = 0.03$). The Bonferroni post-hoc test showed that neither-types with high levels of perfectionistic concerns reflected the highest scores on workaholism scale (3.18 ± 0.10) compared to morning-types (2.60 ± 0.18 , $p < 0.05$) and evening-types with high levels of perfectionistic concerns (2.93 ± 0.29 , $p = 1$). For the moderation analysis, working hours were significantly related to workaholism ($B = 0.01$, $LLCI = 0.01$, $ULCI = 0.02$), while the interaction among circadian typology and perfectionistic concerns to workaholism was close to significant ($B = -0.01$, $LLCI = -0.02$, $ULCI = 0.00$, $p = 0.06$).

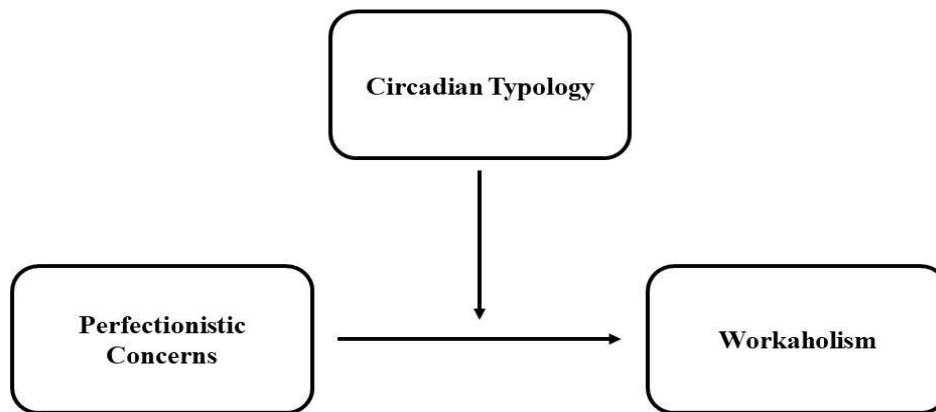


Figure 1. The hypothesized moderation model (Template 1).

Results

Based on circadian typology, our study comprised of 95 morning-type (37 men and 58 women), 250 neither-type (96 men and 154 women) and 24 evening-type (12 men and 12 women). The circadian typology of participants did not differ by gender, $X^2(2, N = 369) = 1.24, p > .05$. As regards perfectionistic concerns, our study comprised 81 participants with low levels of perfectionistic concerns (35 men and 46 women), 255 participants with medium levels of perfectionistic concerns (85 men and 140 women) and 61 participants with high levels of perfectionistic concerns (25 men and 36 women). These frequencies did not differ by gender, $X^2(2, N = 369) = 0.80, p > .05$.

Descriptive statistics and zero-order correlations are reported in Table 1. **Table 1.** Descriptions and inter-correlations of the study variables.

Variables	Mean	SD	1	2	3	4	5
1.Age	38.59	11.53					
2.Circadian Typology	54.02	7.80	0.30**				
3.Perfectionistic concerns	2.68	0.77	-0.13*	-0.08			
4.Workaholism	2.60	0.73	-0.01	-0.11*	0.37**		
5.Workload	3.64	0.70	-0.23**	-0.10	0.11*	0.22**	

** $p < 0.01$; * $p < 0.05$.

Circadian typology was positively and significantly correlated with age, whereas it was negatively and significantly correlated with workaholism. In contrast, perfectionistic concerns were negatively and significantly correlated with age, whereas they were positively and significantly correlated with workaholism. Workload was negatively and significantly correlated with age, while it was positively and significantly correlated with perfectionistic concerns and workaholism.

The results of ANCOVA showed a significant effect of perfectionistic concerns on workaholism ($F_{2,355} = 7.23, p < 0.05, \eta^2_p = 0.04$). Individuals with high levels of perfectionism reported higher scores on BWAS (2.85 ± 0.12) compared to participants with low levels of perfectionism ($2.31 \pm 0.09, p < 0.05$) and medium levels of perfectionism ($2.67 \pm 0.08, p = 0.65$). Although evening-types reported higher levels of workaholism (2.73 ± 0.15) than neither-types (2.66 ± 0.05) and morning-types (2.45 ± 0.82), the circadian typology was not significant ($F_{2,355} = 2.59, p = 0.08, \eta^2_p = 0.01$). More importantly, we found a significant interaction between circadian typology and perfectionistic concerns on BWAS score ($F_{4,355} = 2.83, p < 0.05, \eta^2_p = 0.03$). The Bonferroni post-hoc test (see Figure 2) showed that neither-types with high levels of perfectionistic concerns reflected the highest scores on the workaholism scale (3.19 ± 0.10) compared to morning-types ($2.51 \pm 0.19, p < 0.05$) and evening-types with high levels of perfectionistic concerns ($2.86 \pm 0.30, p = 0.88$). As regards low levels of perfectionistic concerns, evening-types reflected the highest scores on the workaholism scale (2.51 ± 0.24) compared to morning-types ($2.27 \pm 0.13, p = 1$) and neither-types ($2.14 \pm 0.10, p = 0.44$). Similarly, evening-types with medium levels of perfectionistic concerns reflected the highest scores on workaholism scale (2.81 ± 0.21) compared to morning-types ($2.57 \pm 0.09, p = 1$) and neither-type ($2.64 \pm 0.05, p = 0.93$).

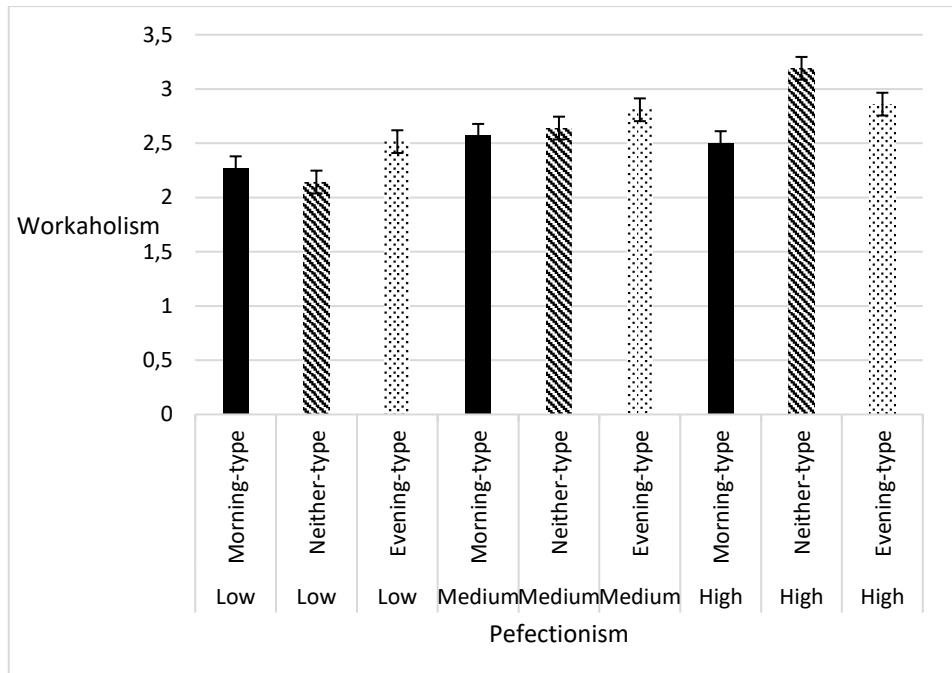


Figure 2. Graphic representation (mean and SEM) of the workaholism score by perfectionistic concerns and circadian typology.

Table 2 reports the results of conditional process analysis on workaholism.

Table 2. Moderation analysis of Circadian typology (M) on the relationship between perfectionism (X) and workaholism (Y)

Variables	B	LLCI	ULCI	R ²
Outcome: workaholism				0.19*
Perfectionistic concerns	0.80**	0.26	1.34	
Circadian Typology	0.01	-0.01	0.04	
Covariate: workload	0.21**	0.10	0.31	
Covariate: age	0.01	0.00	0.13	
Perfectionistic concerns*Circadian Typology	-0.01	-0.02	0.00	

B = unstandardized estimated; LLCI = Lower Level Confidence Interval; ULCI = Upper Level Confidence Interval. ** $p < 0.01$; * $p < 0.05$.

Perfectionistic concerns were significantly related to workaholism ($B = 0.80$, $LLCI = 0.26$, $ULCI = 1.34$), supporting the expected result. Conversely, circadian typology seemed not to be significantly related to workaholism ($B = 0.01$, $LLCI = -0.01$, $ULCI = 0.04$). Regarding the covariates, workload was significantly related to workaholism ($B = 0.21$, $LLCI = 0.10$, $ULCI = 0.31$), while age was nearly significantly related to workaholism ($B = 0.01$, $LLCI = 0.00$, $ULCI = 0.13$, $p = 0.05$). Finally, the

interaction among circadian typology and perfectionistic concerns to workaholism was close to significant ($B = -0.01$, $LLCI = -0.02$, $ULCI = 0.00$, $p = 0.08$). Interestingly, the plot shown in Figure 2 indicates that evening-types with high levels of perfectionistic concerns reported higher levels of workaholism than in the morning as well as neither-types. Following Hayes (2007), the values of perfectionistic concerns were observed at the 16th, 50th, and 84th percentiles in circadian typology.

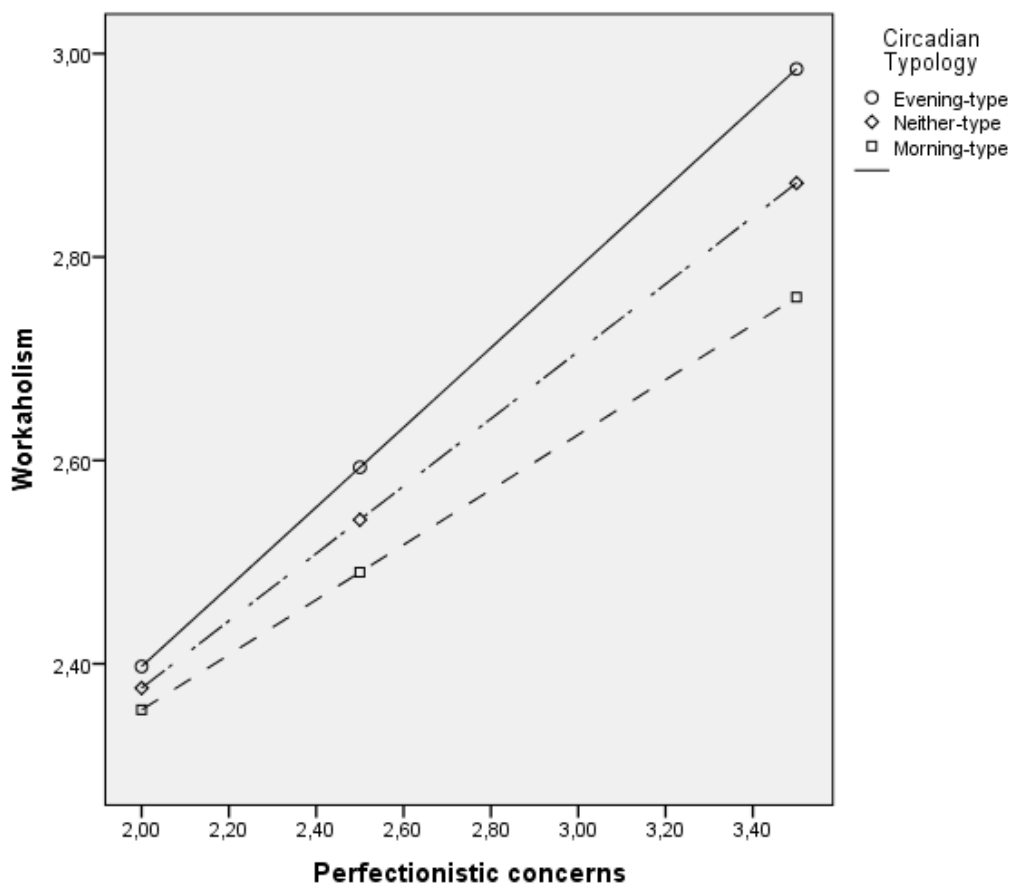


Figure 2. Plot of the interaction between circadian typology and perfectionistic concerns on workaholism.

Discussion

The current study, for the first time, examined how biological (i.e., circadian typology) and psychological (i.e., perfectionism) individual differences were related to

workaholism. The results clearly demonstrated the influence of both factors on this work-related addiction.

As regards perfectionism, all analyses showed a significant relationship between perfectionistic concerns and workaholism. First, perfectionistic concerns were positively and significantly correlated with workaholism. Furthermore, both the ANCOVA and moderation analyses showed a significant relationship between these two variables, with higher levels of perfectionistic concerns associated with higher scores on the BWAS scale. These results, supporting H1, were in line with previous studies (Harari et al. 2018; Spagnoli et al. 2021a). Thus, by extending current knowledge on the role of maladaptive aspects of perfectionism in the work context, we endorse the idea that employees with higher levels of perfectionistic concerns may feel more pressured to persist in their work efforts. As a result, they may be more vulnerable to develop workaholic behaviours.

As regards circadian typology, results showed a negative and significant correlation with workaholism, suggesting that eveningness was associated with workaholism. However, when we performed ANCOVA and moderation analyses, we found that evening-types reported higher levels of workaholism compared to morning-type and neither-types, but these results did not reach statistical significance, not confirming H2. A possible explanation for these results could be the unbalanced gender distribution in the present study. Furthermore, in light of these interesting findings, it is necessary to underline that employees represent a particular category regarding circadian typology. Indeed, according to Taillard (2004), employees tend to shift towards morningness due to social rhythms (e.g., working hours) and job demands. Future studies should take this issue into account and, through an interdisciplinary approach, investigate further the role of circadian typology in the work context, especially concerning workaholism. These findings, therefore, allow us to formulate new questions about the

biological nature of workaholism. For instance, through the lens of addiction theories, it is difficult to demonstrate the mechanisms underlying the concept of work as an addictive substance, **as we can with** chemicals involved in drug and alcohol addictions (McMillan et al. 2001). On the other hand, according to the biopsychosocial model (Engel 1977), human behaviour is seen as the result of the interplay between biological, psychological and social factors. **From** this perspective, McMillan and O'Driscoll (2008) suggested that the genesis of workaholism is multifactorial and is characterized by interactions between personal dispositions (e.g., personality traits), cognitive and emotional processes, behaviours learned by the individuals, and situational factors (e.g., work context) factors. Building on the biopsychosocial model, future studies could investigate the relationship between circadian typology and workaholism longitudinally.

Finally, regarding hypotheses H3 and H4, both the interaction between morningness-eveningness preference and perfectionistic concerns and the moderating role of morningness-eveningness preference on workaholism reported a specific pattern. In both ANCOVA and moderation analyses, the neither- and, more important, evening-types reported workaholism. Taking into account the unbalanced distribution of circadian typology within the sample, the result pattern was in line with the study by Andreassen et al. (2014a) with no relationship between morningness and workaholism and a relationship between eveningness and workaholism. The preference for the evening time-of-day (Fabbri et al. 2007, 2013) could allow evening-types to continue to work in the later moment of the day. Moreover, the present study demonstrated for the first time that eveningness and perfectionism were two important **factors** in determining workaholism. The interaction between these two factors could be based not only on their relationship (Natale et al. 2008) **but also, for example, on their link** with neuroticism and extraversion (Lipnevich et al. 2017; Smith et al. 2019).

Results from our study should be considered in light of some limitations. First, the cross-sectional nature of the study does not allow for a causal inference between the variables. Second, the sample is too small to obtain a balanced distribution in circadian typology, so future studies should consider a larger sample. Third, the snowball technique for data collection is in contrast to many of the assumptions supporting conventional notions of random selection and representativeness. However, this sampling strategy is one of the most commonly used in organizational research (Halbesleben et al. 2008). Fourth, since we have considered workaholism as an overall phenomenon (Andreassen et al. 2012), this approach limits our ability to examine the dimensions of workaholism separately. The Multidimensional Workaholism Scale (MWS), recently developed by Clark and colleagues (2020), views workaholism as a multidimensional construct, including motivational, cognitive, emotional, and behavioural dimensions. In line with this approach, it would be interesting for future studies to evaluate the model proposed in the current study with the four dimensions of this new scale. Finally, the sleep schedule of the participants was not considered in the present study. In light of the hypothesis that social demands (e.g., family and childcare) may influence the sleep schedule more for women than for men (Leonhard and Randler 2009), and that sleep patterns differ between morning and evening types (Taillard et al. 2003), future studies should take this into account concerning circadian typology.

Despite these limitations, the present study had the merit to expand our knowledge on the relationship between circadian typology, perfectionism, and workaholism. Until now, only one study has examined the relationship between morningness and workaholism (Andreassen et al. 2017), focusing on a specific job category (shift nurses). In addition, we considered circadian typology in the context of the relationship between perfectionistic concerns and workaholism, a relationship recently considered in the

literature. **Thereby contributing** to the current knowledge about the relationship between perfectionistic concerns and workaholism, **and, introducing** circadian typology as an individual difference that might influence the onset of workaholism. Thus, the present study offers a new view in the field of workaholism, emphasizing the importance of considering chronobiological aspects in the increasingly ‘always-on’ work context.

Disclosure statement

No potential conflict of interest was reported by the authors.

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