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Csilla Ágoston

Patterns and psychological correlates of caffeine consumption

Doctoral School of Psychology
Head of the School: Prof. Zsolt Demetrovics, DSc
Personality and Health Psychology Program
Head of the Program: Attila Oláh, CSc

Supervisor: Prof. Demetrovics Zsolt, DSc

Committee members:

President:	Dr. Habil. Oláh Attila, CSc
Secretary:	Dr. Habil. Katalin Felvinczi, PhD
Opponents:	Dr. Eszter Kótyuk, PhD
	Dr. Olivér Nagybányai Nagy, PhD
Members:	Dr. Ágota Örkényi, PhD
	Dr. Melinda Pénzes, PhD
	Dr. Sándor Lisznyai, PhD
	Dr. Tamás Martos, PhD

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Background and aims

Caffeine is probably the most popular psychoactive substance in the world. There are a lot of natural – e.g. coffee bean, black and green tea leaves, cola nut, guarana and maté – as well as synthetic sources – e.g. energy drinks and several pharmaceutics including painkillers – of caffeine (Durrant, 2002). Due to the high prevalence of caffeine use and caffeine's low, but documented addictive potential, its consumption may has some consequences on physical and mental functioning which is important from a public health perspective.

During my doctoral studies I focused on the research of the psychological aspects of caffeine consumption. Research on other psychoactive substances and addictive behaviors emphasized the importance of revealing the motives, in order to gain a better understanding of each addictive behavior and to predict severity of addiction (Cooper, Kuntsche, Levitt, Barber, & Wolf, 2016; Kiraly et al., 2015; Wicki et al., 2017). Therefore, I wanted to explore the motives behind the consumption of different caffeinated beverages and ***(1)*** to develop a reliable measurement tool for assessing the motives of caffeine consumption.

Since caffeine use disorder (CUD) has been included to DSM-5 as a 'condition for further study' (American Psychiatric Association, 2013), ***(2)*** another aim of my studies was to develop a measurement tool – the Caffeine Use Disorder Questionnaire (CUDQ) – which is suitable for assessing the symptoms of caffeine use disorder. As there is a debate on the clinical significance of CUD, I wanted to explore the importance of each items in order to see which symptoms indicate a more problematic caffeine consumption pattern. The metabolism of caffeine is stimulated by smoking (Arnaud, 2011), thus ***(3)*** I have examined the possible differences in caffeine consumption and CUD symptoms between regular smokers, occasional smokers and non-smokers. My further objective was ***(4)*** to explore the possible clinical relevance of caffeine use disorder by comparing the amount and severity of the symptoms with the degree of subjective psychological well-being.

By using these two newly developed questionnaires, I wanted to explore whether there are differences in the motives of caffeine consumption and in caffeine use disorder ***(5)*** between males and females, ***(6)*** people with different age and ***(7)*** the consumers and non-consumers of different caffeinated beverages (namely coffee, tea, energy drinks and cola). This latter research question was inspired by the editorial of Lauture and Broderick (2014); the authors emphasized that we should consider not merely the total daily consumption of caffeine, but also the type of consumed caffeinated beverage in order to draw more appropriate conclusions from the results.

I also attempted to explore ***(8)*** what kinds of possible latent groups can be distinguished based on the type of caffeinated beverage consumed daily and the degree of consumption.

Based on the aforementioned studies on the field of addiction (Cooper et al., 2016; Kiraly et al., 2015; Wicki et al., 2017) I wanted to reveal ***(9)*** which caffeine consumption motives and to what extent can predict the magnitude of caffeine use disorder. I also wanted to explore the relationship between caffeine consumption and disordered eating and body attitudes and the possible role of weight control as a caffeine consumption motive on the relationship of these two variables. Based on the results of previous studies (e. g. Hart, Abraham, Luscombe, & Russell, 2005; Hatsukami, Eckert, Mitchell, & Pyle, 1984; Krahn, Hasse, Ray, Gosnell, & Drewnowski, 1991) I hypothesized that ***(10)*** disordered eating and body attitudes will have a positive correlation with caffeine consumption. Beyond the total consumption, ***(11)*** I wanted to explore whether the consumption of the four caffeinated beverages (coffee, tea, energy drink, cola) are related to the level of disordered eating and body attitudes. Since previous studies have found that problematic (such as abusive) use of caffeine may be more pronounced among people with eating disorders (e. g. Burgalassi et al., 2009), I hypothesized that ***(12)*** the magnitude of disordered eating and body attitudes is associated with the increased appearance of caffeine use disorder symptoms. On the basis of previous studies (Harper, Sperry, & Thompson, 2008; Peebles et al., 2012) I assumed that ***(13)*** the level of disordered eating and body attitudes, and also ***(14)*** the level of caffeine consumption will be higher among the visitors of weight loss and pro-ana forums compared to university students. I also hypothesized that ***(15)*** weight control as a caffeine consumption motive will be a mediator in the relationship of caffeine consumption and disordered eating and body attitudes.

Some of my other hypotheses were based on Khantzian's self-medication theory which indicates that the use of various psychoactive substances is not incidental: people use depressant, stimulant and hallucinogenic drugs for different reasons, depending on their underlying psychopathologies or mental disorders (Khantzian, 1985). Caffeine is a psychostimulant, therefore I assumed that those people who has more symptoms of attention deficit and hyperactivity disorder (ADHD) will have different caffeine consumption habits compared to those with less symptoms – since stimulant medication is accepted in the treatment of ADHD, caffeine would be a logical choice for self-medication. Thus, I first examined whether ***(16)*** the level of ADHD symptoms is higher among the consumers of the four caffeinated beverages compared to non-consumers and whether it is associated with higher extent of caffeine consumption. My further hypothesis is that ***(17)*** those who have more ADHD

symptoms and regularly consume caffeine have higher psychological well-being than those who have more ADHD symptoms, but do not consume caffeine.

The hypotheses regarding the relationship of caffeine consumption, caffeine use disorder and chronotype were also based on the self-medication hypothesis. Several studies have shown that the appearance of different risk behaviors is more frequent among "evening" type people (‘owls’) compared to morning type people (‘larks’), and that the use of stimulants can help ‘owls’ to overcome the so-called “social jetlag” (Wittmann, Dinich, Merrow, & Roenneberg, 2006). Therefore, I assumed that ***(18)*** eveningness will have a positive correlation with caffeine consumption and ***(19)*** a negative correlation with psychological well-being – probably due to social jetlag. Furthermore, based on the research of Wittmann et al. (2010), I also assumed that ***(20)*** caffeine consumption mediates the relationship between chronotype and psychological well-being. I hypothesized that ***(21)*** higher eveningness will be associated with a greater degree of caffeine use disorder, and ***(22)*** the higher degree of caffeine use disorder will have a negative correlation with psychological well-being. In addition, ***(23)*** I examined the possible mediator role of each caffeinated beverages (coffee, tea, energy drink, cola) separately.

Finally, I studied a rare, but clinically relevant condition, namely, caffeine-induced psychosis (Goiney, Gillaspie, & Alvarez Villalba, 2012). First of all ***(24)***, I have carried out the Hungarian adaptation of two questionnaires: the Launay-Slade Hallucination Scale (LSHS-R) (Launay & Slade, 1981) and the Persecutory Ideation Questionnaire (PIQ) (McKay, Langdon, & Coltheart, 2006), which were developed to measure psychosis-like experiences (hallucinations/persecution ideations) in both healthy and psychiatric populations. On the other hand, with the help of the newly adapted questionnaires, I examined ***(25)*** whether the relationship between caffeine consumption and certain psychosis-like experiences (hallucinations/persecution ideations), which was found in some previous studies (Crowe et al., 2011; Jones & Fernyhough, 2009) can be demonstrated in a large sample of healthy Hungarian adults. I have explored whether ***(26)*** there are differences in the magnitude of psychosis-like symptoms between the consumers and non-consumers of certain caffeinated products (coffee, tea, energy drinks, cola).

Subsequently, in a double-blind, placebo controlled experiment, I examined the relationship between acute caffeine consumption, acute stress and psychosis-like experiences, which should provide stronger evidence than the aforementioned studies (Crowe et al., 2011;

Jones & Fernyhough, 2009) to the question ***(27)*** whether caffeine and stress are actually capable of causing hallucinatory experiences and memory distortions related to threatening words, and ***(28)*** how much is this affected by the caffeine consumption habits of the participants.

Methods

I present the results of four empirical studies in the thesis. In the first study I tested the original version of the newly developed Motives for Caffeine Consumption Questionnaire (MCCQ) for the first time. Participants of this study were university students and the employees of a company in Western Hungary (N = 598, 28.6 % male, mean age = 27.8 years, SD = 10.6).

In the second cross-sectional online questionnaire study (N = 302, 13.9 % male, mean age = 28.1 years, SD = 10.9) I performed the psychometric analysis of the modified version of MCCQ and examined the associations of caffeine consumption, caffeine use disorder, disordered eating and body attitudes and weight control/appetite suppression as a caffeine consumption motive. Participants were university students and visitors of 35 weight loss or pro-ana forums in Hungary. Participants had to fill the Caffeine Dependence and Withdrawal Checklist (CDWC) (Hughes, Oliveto, Liguori, Carpenter, & Howard, 1998), the Eating Attitudes Test (Garner, Olmsted, Bohr, & Garfinkel, 1982), the Body Attitude Test (Probst, Vandereycken, Coppenolle, & Vanderlinden, 1995) and the body figure rating by Fallon and Rozin (1985).

In the third cross-sectional questionnaire study we recruited participants (N = 2259, 70.5% male, mean age = 34.0 years, SD = 9.3) via a news webpage (www.444.hu). In this study, I accomplished the psychometric analysis of the final version of MCCQ, and performed an item response theory analysis on the newly developed Caffeine Use Disorder Questionnaire (CUDQ), which was developed on the basis of the recommendations of DSM-5. I also accomplished the Hungarian adaptation of two questionnaires - the Persecutory Ideation Questionnaire (McKay et al., 2006) and the Launay-Slade Hallucination Scale (Launay & Slade, 1981). In addition, we used the Adult ADHD Self-Report Scale (ASRS-V1.1) (Kessler et al., 2005) which is a screening tool for ADHD, the reduced Morningness-Eveningness Questionnaire (rMEQ) (Adan & Almirall, 1991) for assessing chronotype and the WHO Well-Being Index (WBI-5) (Susánszky, Konkoly Thege, Stauder, & Kopp, 2006).

In the fourth study, which was a double-blind, randomized, placebo controlled experiment, 182 participants were involved (35.4% male, mean age = 23.6 years, SD = 6.3). Habitual caffeine consumers (n = 92) and also non-consumers (n = 90) were randomized to caffeine (100 mg) or placebo groups and stress-induction or no stress-induction groups. The level of persecution ideations (more precisely the memory distortions associated with threatening stimuli) was measured by the memory test of Bentall, Kaney and Bowen-Jones (1995) which was adapted to Hungarian for the current experiment, and which contains neutral, depressive and threatening words. Hallucinations-like experiences were measured by the White Christmas Paradigm (Merckelbach & van de Ven, 2001), which focuses on the number of false alarms given by the participant. I controlled the degree of trait anxiety, social desirability, the proneness to hallucination-like experiences and persecutory ideations, and I checked the effect of stress manipulation by assessing the level of state anxiety before and after the intervention.

Theses and results

The results are presented in the order of the goals and hypotheses described in the *Background and aims* section.

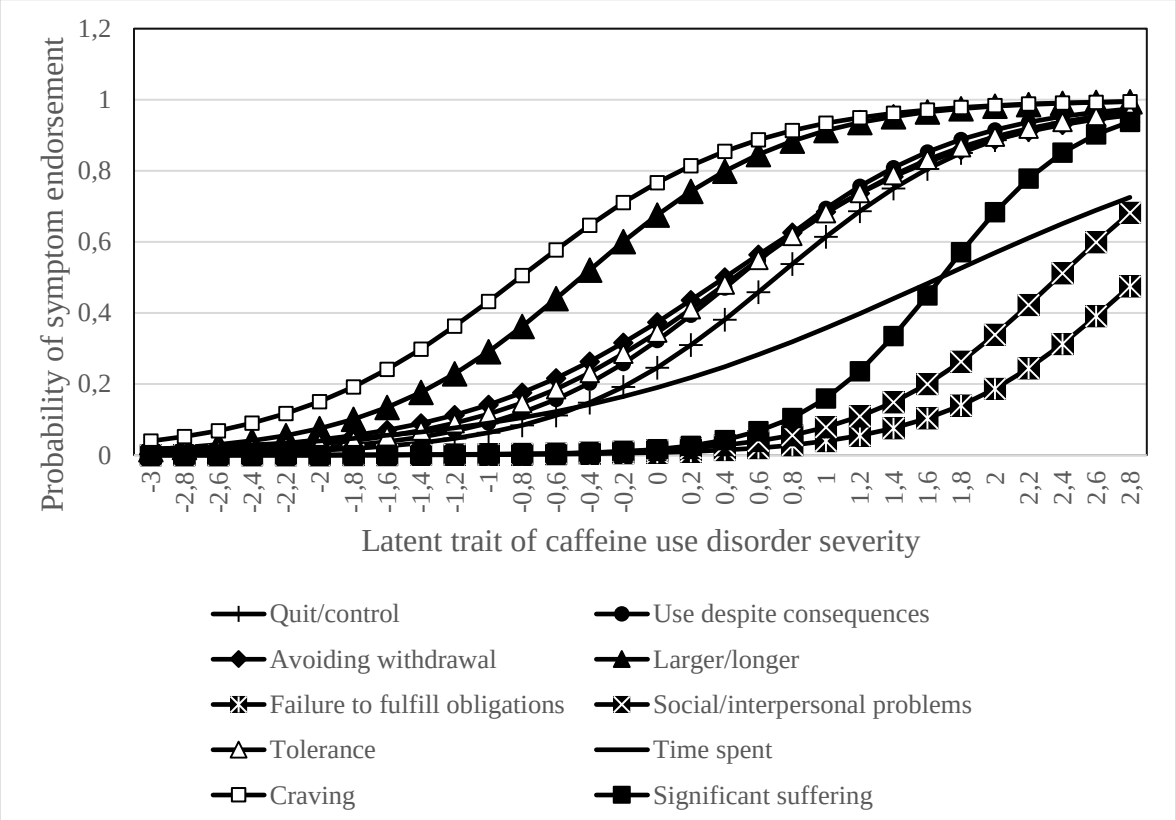
(1) Development of a valid and reliable measurement tool for assessing the motives of caffeine consumption

In the first study, six factors emerged in the exploratory factor analysis of the 39-item MCCQ, but I had to remove several items due to low factor loadings or high cross-loadings. Finally, I could keep 23 items which resulted in a lower stability of the factors. Therefore, in the second research I have extended the MCCQ with new items and another factor, and I performed a confirmatory factor analysis (CFA) on the modified version. Based on the CFA, one item had to be removed due to cross-loading. I tested the final version of MCCQ in the third study. This final, 37-item version of MCCQ had a stable seven-factor structure with good fit indices ($\chi 2$ = 5431.60, df = 608, p <0.001, CFI = 0.922, TLI = 0.914, SRMR = 0.049, RMSEA = 0.059 [CI: 0.058-0.061]) and the subscales had high internal consistency (Cronbach's alphas = 0.72-0.96). The seven factors included the following motives: habit, alertness, mood, social, taste, symptom management, weight control. The newly developed MCCQ covers a wider range of possible motivations compared to previous measurement tools, which included four motives (see Graham, 1988; Irons et al., 2014).

(2) Development of a valid and reliable measurement tool for assessing caffeine use disorder

I examined the items of the newly developed Caffeine Use Disorder Questionnaire by using an item response theory analysis, and I found that the *'significant suffering due to the symptoms'* criterion had the highest discriminative value (a = 2.43, standard error = 0.23) at a higher degree of latent trait (namely, this item was the most capable to distinguish those people who are at a lower degree of the latent trait from those who are at a higher degree of the latent trait of caffeine use disorder), while the least discriminating item was *'the time spent with caffeine use'* (a = 0.87, standard error = 0.08) (Figure 1). The criteria of *'failure to fulfill obligations'* (b = 2.86, standard error = 0.22) and *'social/interpersonal problems'* (b = 2.38, standard error = 0.15) were the most serious symptoms, while endorsement the *'consumption of more caffeine or longer than intended'* (b = -0.45, standard error = 0.04) and *'craving'* (b = -0.82, standard error = 0.05) criteria were discriminative at a lower level of CUD, therefore these are considered to be less serious symptoms (Figure 1). The one-factor solution had excellent fit indices ($\chi 2 = 216.3$, df = 35, $p < 0.001$, TLI = 0.948, CFI = 0.960, RMSEA = 0.048 [CI: 0.042-0.054], WRMR = 1.751).

Figure 1 – Item characteristic curves (ICCs) for DSM-5 proposed caffeine use disorder criteria. ICCs illustrate the probability of symptom endorsement (y-axis) across the latent trait of caffeine use disorder severity (x-axis).



(3) Differences between regular smokers, occasional smokers and non-smokers in caffeine consumption and caffeine use disorder

In the second study, smokers consumed more caffeine than non-smokers ($U = 11936.5$, $p = 0.021$, $r = 0.13$), and the heaviness of smoking showed a positive correlation with the magnitude caffeine consumption as well ($r = 0.233$, $p = 0.049$). Similarly, in the fourth study, more caffeine was consumed by regular smokers than non-smokers ($U = 546.0$ $p < 0.001$, $r = -0.35$). In the third study, I examined the relationship between smoking and caffeine use disorder: regular smokers had more CUD symptoms than non-smokers, but this difference was probably due to the higher daily caffeine consumption of smokers, because the relationship between smoking status and CUD disappeared when I used total daily caffeine consumption as a covariate [$F(2) = 1.745$, $p = 0.175$].

(4) Exploring the possible clinical relevance of caffeine use disorder by comparing the amount of symptoms and subjective well-being

Based on the results of the third study I suggest that we should pay greater attention to the following symptoms when we consider the clinical importance of caffeine use disorder: *significant suffering due to the symptoms, failure to fulfill obligations* and *social/interpersonal problems*. All three symptoms indicate an impaired functioning in everyday life, so they all be able to denote the emerging or developed clinical problems. The path analyses which I have conducted on the sample of my third study showed negative associations between psychological well-being and the magnitude of CUD (from $\beta = -0{,}085$ to $\beta = -0{,}193$) which emphasize the possible clinical relevance of caffeine use disorder.

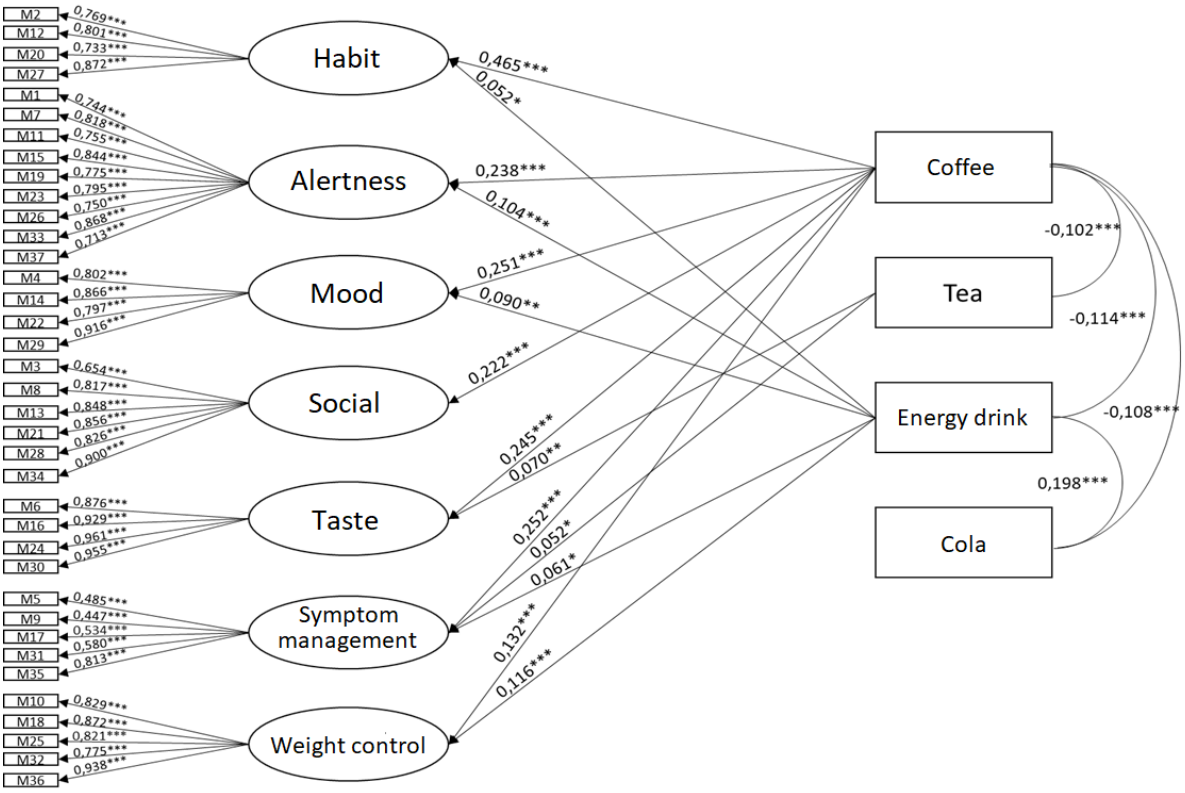
(5-6) Gender and age differences in the motives for caffeine consumption and in caffeine use disorder

Women had significantly higher scores on all motivational factors and also in the magnitude of caffeine use disorder, but consumed significantly less caffeine than men. Age had a negative correlation with the *'alertness'* motive ($r = -0.135$, $p < 0.001$) and caffeine use disorder ($r = -0.071$, $p = 0.001$) and a positive correlation with the *'taste'* ($r = 0.053$, $p = 0.017$) and the *'habit'* motives ($p = 0.079$, $p < 0.001$).

(7) Differences between caffeine consumer groups (coffee consumers, tea consumers, energy drink consumers, cola consumers) in the motives for caffeine consumption and in caffeine use disorder

Coffee consumption had a positive correlation with all of the caffeine consumption motives, while tea consumption was associated only with *'symptom management'* and *'taste'*. The consumption of energy drinks had a positive association with *'habit', 'alertness', 'mood', 'symptom management'* and *'weight control'* but not with *'taste'* and *'social'* motives. Cola consumption was not associated with any of the motives (Figure 2). Caffeine use disorder was positively associated with daily coffee (β = 0.235), energy drink (β = 0.160) and cola consumption (β = 0.050) and was negatively related to tea consumption (β = -0.057).

Figure 2 – The difference between caffeine consumer groups (coffee, tea, energy drink and cola consumers) in the motives for caffeine consumption



(8) Latent groups of caffeine consumers based on the type of the consumed caffeinated beverage and the degree of consumption

In the third study I aimed to reveal the possible latent groups of caffeine consumers, which was only partially successful because none of the latent group analyses provided unequivocal solution. The most interpretable grouping solution included the following latent groups: 1. people who consume mostly coffee, 2. people who consume mostly coffee and cola, 3. people who consume mostly coffee and energy drinks. Caffeine use disorder was significantly higher in the third group (coffee and energy drink) compared to the other two

groups (F (2) = 14.37, p <0.001, η^2_p = 0.014, r = 0.12] which indicate that besides coffee, the consumption of energy drinks can substantially contribute to the development of CUD.

(9) Examination of the relationship between caffeine consumption motives, caffeine consumption and caffeine use disorder

Participants who scored higher on *'habit'* (β = 0.193) *'alertness'* (β = 0.257) *'mood'* (β = 0.156) or *'weight control'* (β = 0.064), had more symptoms of caffeine use disorder. However, those who drank caffeinated beverages because of the *taste* of the beverage had less CUD symptoms (β = -0.117). The *'social'* and *'symptom management'* motives were not related to the magnitude of caffeine use disorder.

(10-12) Investigating the relationship between caffeine consumption, caffeine use disorder and disordered eating and body attitudes

In accordance with my hypotheses, the total daily caffeine consumption had a low positive correlation with disordered eating attitudes (r = 0.193, p <0.01) and disordered body attitudes (r = 0.203, p <0.01). The consumers of coffee, tea or cola did not have higher level of disordered eating or body attitudes than non-consumers. However, those who consumed energy drinks daily, had more disordered eating attitudes (U = 3346.5, p <0.01, r = 0.18) and body attitudes [t(247) = -3.821, p <0.001, r = 0.24] than non-consumers. The amount of caffeine use disorder symptoms was also positively correlated with disordered eating (r = 0.243, p <0.001) and body attitudes (r = 0.282, p <0.001).

(13-14) Comparison of university students and the visitors of weights loss/pro-ana forums in terms of disordered eating and body attitudes and the magnitude of caffeine consumption

Both the level of disordered eating attitudes (U = 13716.0, p <0.001, r = 0.48) and disordered body attitudes [t(183.274) = -8.041, p <0.001, r = 0.51] were higher among the visitors of the weight loss/pro-ana forums compared to university students, with a high effect size. Regarding caffeine use, only total daily caffeine consumption (U = 13441.0, p <0.001, r = 0.21) and the consumption of coffee (U = 14343.0, p <0.001, r = 0.28) was higher among the visitors of weight loss/pro-ana forums compared to university students.

(15) Examination of the possible mediator role of weight control motive on the relationship of caffeine consumption and disordered eating and body attitudes

In one of the path analyses I found a direct positive association between disordered body attitudes and energy drink consumption (β = 0.392), between disordered body attitudes and weight control motivation (β = 0.140), between disordered eating attitudes and weight control motivation (β = 0.507) as well as between weight control motivation and coffee consumption (β = 0.225). The weight control motivation for caffeine use was a significant mediator between disordered eating attitudes and coffee consumption (β = 0.114).

(16-17) Exploring the relationship of ADHD symptoms, caffeine consumption, caffeine use disorder and psychological well-being

My 16th hypothesis, that those who have more ADHD symptoms consume more caffeine or are more likely to consume certain caffeinated beverages, was rejected. Neither the comparison of the four ADHD groups nor the path analysis showed any connection between ADHD and coffee, tea, energy drink or cola consumption or daily caffeine consumption. However, the four ADHD groups differed in the level of caffeine use disorder [Welch F(3, 202.001) = 59.207, p <0.001, r = 0.29]. The results of the path analysis also suggested that the level of ADHD symptoms was positively associated with the level of caffeine use disorder (β = 0.350) and negatively associated with psychological well-being (β = -0.259).

(18-23) Exploring the relationship of chronotype, caffeine consumption, caffeine use disorder and psychological well-being

The 18th and 19th hypotheses, which were related to 'social jetlag', were partially verified: higher eveningness was associated with lower well-being (β = 0.219), but chronotype was only partially associated with the consumption of different caffeinated beverages: higher eveningness led to the higher probability of cola (β = -0.162) and energy drink consumption (β = -0.227) and lower probability of tea consumption (β = 0.106), while it did not have any association with coffee consumption and total daily caffeine consumption. (The lower score on the questionnaire indicates a higher level of eveningness, and this explains the opposite directions of the standardized regression coefficients).

The hypothesis that caffeine consumption mediates the relationship between chronotype and psychological well-being was only partially fulfilled and the results were the contrary to what was expected: higher morningness led to the higher probability of tea consumption and tea consumption was associated with higher psychological well-being.

In accordance with the 21st and 22nd hypotheses, higher eveningness was associated with higher level of CUD (β = -0.104), while the higher level of CUD was associated with lower well-being (β = -0.187). Moreover, energy drink consumption mediated the association between eveningness and CUD.

(24) The Hungarian adaptation of questionnaires related to the measurement of psychosis-like experiences (hallucinations and persecution ideation)

The Persecutory Ideation Questionnaire had a stable, one-factor structure as expected ($\chi2 = 573.175$, df = 35, p <0.001, CFI = 0.956, TLI = 0.944, RMSEA = 0.083 (CI: 0.077-0.089), SRMR = 0.031) and very good internal consistency (Cronbach alpha = 0.91). For LSHS-R, the two-factor solution was the most suitable (KMO = 0.86, Bartlett's test: $\chi2 = 7788.023$, df = 66, p <0.001, explained variance: 38%). The factors of the LSHS-R were 'Vivid mental events' and 'Clinical hallucinations'.

(25-26) Investigating the relationship between caffeine consumption and psychosis-like experiences (hallucinations, persecutory ideation)

My 25th hypothesis, that there is a positive correlation between caffeine consumption, the proneness to hallucinations and persecutory thoughts, was not fulfilled. The 26th hypothesis was partially verified, since only the daily consumption of energy drinks was associated with the slightly elevated level of persecutory ideation (U = 87380, p = 0.039, r = 0.05). However, I could reveal a previously unexpected and unexamined relationship between the symptoms of caffeine use disorder and psychosis-like experiences, with low-medium effect size (persecutory ideation: r = 0.234, p <0.001, 'Vivid mental events': r = 0.254, p <0.001, 'Clinical hallucinations': r = 0.201, p <0.001).

(27-28) Examining the relationship between caffeine, stress and perception in a partially double-blind, placebo controlled experiment

Based on the results of the experiment, acute stress led to an increased level of hallucinatory experiences [$F(1) = 4.811$, $p = 0.030$, $\eta^2_p = 0.030$], but acute caffeine consumption did not have any effect. Sensitivity to threatening stimuli was not enhanced by stress or caffeine. This finding supports the diathesis-stress model which indicate that stress contributes to the development of psychotic experiences, and the proneness to psychosis increases the response to stressors (Walker & Diforio, 1997).

Discussion

My results provided evidence for the existence of caffeine use disorder. Although most of the people are able to use caffeine in a healthy way, a small minority may develop lower psychological well-being and clinically relevant functional disturbances because of caffeine consumption. I have been able to find out what kind of motives are in the background of caffeine consumption, and that these motives are differently related to the consumption of coffee, tea, energy drinks and cola, the total daily caffeine consumption and the level of caffeine use disorder. As I mentioned in the *Background and aims* section, certain motives can predict the severity of addiction in the case of other substances and addictive behaviors; now I have evidence that some of the motives – namely '*alertness', 'habit', 'mood' and 'weight control'* – are important predictors of problematic use in the case of caffeine. Overall, the results also point to the fact that coffee consumers (and partly energy drink consumers) have stronger motives to consume caffeine and can be characterized with a higher level of caffeine use disorder compared to the other consumer groups.

It was also an important outcome of my studies that mostly not caffeine consumption itself, but the level of caffeine use disorder was associated with most of the examined variables. The degree of caffeine use disorder was positively associated with disordered eating and body attitudes, ADHD symptoms, eveningness, and psychosis-like experiences (proneness to hallucinations, persecutory ideation).

The results of the experiment on the effects of caffeine and stress on psychosis-like experiences – which was a barely researched area before – showed that the acute consumption of 100 mg of caffeine does not cause any perceptual distortions in regular consumers and non-consumers of caffeine, but stress increased the appearance of hallucination-like experiences, so it is worth exploring the possible effects of stress in future research.

Publications in the topic of the thesis

Ágoston, C., & Demetrovics, Z. (2018). Lehet-e problémás a koffeinfogyasztás? – A koffeinhasználati zavarral, mint lehetséges új diagnosztikus kategóriával kapcsolatos kutatási eredmények ismertetése. In D. Ocsovai & K. Zsédel (Eds.), *Gerevich70 - A terápiák társadalmától a teremtő vágyakig. Köszöntő kötet Gerevich József hetvenedik születésnapjára* (pp. 191-204). Budapest: Noran Libro. [Ágoston, C., & Demetrovics, Z. (2018). Can caffeine consumption be problematic? – Introduction of the current results related to caffeine use disorder as a possible new diagnostic category. In D. Ocsovai & K. Zsédel (Eds.), *Gerevich70 – From the society of therapies to creating desires. Greeting for the seventieth birthday of József Gerevich* (pp. 191-204). Budapest: Noran Libro.]

Ágoston Cs., Király O., Demetrovics Zs. (2018). Pszichózisszerű tünetek mérési lehetőségei és kapcsolatuk a koffeinfogyasztással egészséges felnőtt populációban. *Psychiatria Hungarica* (megjelentés alatt). [Ágoston Cs., Király O., Demetrovics Zs. (2018). Measuring psychosis-like symptoms and their relationship with caffeine consumption in healthy adult population. *Psychiatria Hungarica* (in press).]

Ágoston, C., Urbán, R., Király, O., Griffiths Mark, D., Rogers Peter, J., & Demetrovics, Z. (2018). Why Do You Drink Caffeine? The Development of the Motives for Caffeine Consumption Questionnaire (MCCQ) and Its Relationship with Gender, Age and the Types of Caffeinated Beverages. *International Journal of Mental Health and Addiction, 16*(4), 981-999. doi:10.1007/s11469-017-9822-3

Ágoston, C., Urbán, R., Richman, M. J., & Demetrovics, Z. (2018). Caffeine use disorder: An item-response theory analysis of proposed DSM-5 criteria. *Addictive Behaviors, 81*, 109-116. doi:10.1016/j.addbeh.2018.02.012

References

Adan, A., & Almirall, H. (1991). Horne & Östberg morningness-eveningness questionnaire: A reduced scale. *Personality and Individual Differences, 12*(3), 241-253. doi:http://dx.doi.org/10.1016/0191-8869(91)90110-W

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. Washington, DC: Author.

Arnaud, M. J. (2011). Pharmacokinetics and Metabolism of Natural Methylxanthines in Animal and Man. In B. B. Fredholm (Ed.), *Methylxanthines*. Heidelberg Dordrecht London New York: Springer.

Bentall, R. P., Kaney, S., & Bowen-Jones, K. (1995). Persecutory delusions and recall of threat-related, depression-related and neutral words. *Cognitive Therapy and Research, 19*(4), 445-457.

Burgalassi, A., Ramacciotti, C. E., Bianchi, M., Coli, E., Polese, L., Bondi, E., . . . Dell'Osso, L. (2009). Caffeine consumption among eating disorder patients: Epidemiology, motivations, and potential of abuse. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity, 14*(4), e212-e218. doi:10.1007/BF03325119

Cooper, M. L., Kuntsche, E., Levitt, A., Barber, L. L., & Wolf, S. (2016). Motivational Models of Substance Use: A Review of Theory and Research on Motives for Using Alcohol, Marijuana, and Tobacco. In K. J. Sher (Ed.), *The Oxford Handbook of Substance Use and Substance Use Disorders: Volume 1* (pp. 375-427).

Crowe, S. F., Barot, J., Caldow, S., D'Aspromonte, J., Dell'Orso, J., Di Clemente, A., . . . Sapega, S. (2011). The effect of caffeine and stress on auditory hallucinations in a non-clinical sample. *Personality and Individual Differences, 50*(5), 626-630. doi:http://dx.doi.org/10.1016/j.paid.2010.12.007

Durrant, K. L. (2002). Known and hidden sources of caffeine in drug, food, and natural products. *Journal of the American Pharmaceutical Association, 42*(4), 625-637.

Fallon, A. E., & Rozin, P. (1985). Sex differences in perceptions of desirable body shape. *Journal Abnormal Psychology, 94*(1), 102-105.

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: psychometric features and clinical correlates. *Psychological Medicine, 12*(4), 871-878.

Goiney, C. C., Gillaspie, D. B., & Alvarez Villalba, C. L. (2012). Addressing Caffeine-induced Psychosis: A Clinical Perspective. *Addictive Disorders and Their Treatment, 11*(3), 146-149. doi:doi: 10.1097/ADT.0b013e31823eb8e2

Graham, K. (1988). Reasons for consumption and heavy caffeine use: generalization of a model based on alcohol research. *Addictive Behaviors, 13*(2), 209-214. doi:DOI: 10.1016/0306-4603(88)90015-9

Harper, K., Sperry, S., & Thompson, J. K. (2008). Viewership of pro-eating disorder websites: Association with body image and eating disturbances. *International Journal of Eating Disorders, 41*(1), 92-95.

Hart, S., Abraham, S., Luscombe, G., & Russell, J. (2005). Fluid Intake in patients with eating disorders. *International Journal of Eating Disorders, 38*(1), 55-59. doi:10.1002/eat.20155

Hatsukami, D., Eckert, E., Mitchell, J. E., & Pyle, R. (1984). Affective disorder and substance abuse in women with bulimia. *Psychological Medicine, 14*(3), 701-704.

Hughes, J. R., Oliveto, A. H., Liguori, A., Carpenter, J., & Howard, T. (1998). Endorsement of DSM-IV dependence criteria among caffeine users. *Drug and Alcohol Dependence, 52*(2), 99-107. doi:http://dx.doi.org/10.1016/S0376-8716(98)00083-0

Irons, J. G., Heinz, A. J., Bassett, D. T., Correia, C. J., Babson, K. A., Boden, M. T., . . . Bonn-Miller, M. O. (2014). Development and initial validation of the Caffeine Motives Questionnaire. *Journal of Caffeine Research, 4*(2), 49-55. doi:10.1089/jcr.2014.0002

Jones, S. R., & Fernyhough, C. (2009). Caffeine, stress, and proneness to psychosis-like experiences: A preliminary investigation. *Personality and Individual Differences, 46*(4), 562-564. doi:http://dx.doi.org/10.1016/j.paid.2008.10.032

Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., . . . Walters, E. E. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS): a short screening scale for use in the general population. *Psychological Medicine, 35*(2), 245-256.

Khantzian, E. J. (1985). The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence. *American Journal of Psychiatry, 142*(11), 1259-1264. doi:10.1176/ajp.142.11.1259

Kiraly, O., Urban, R., Griffiths, M. D., Agoston, C., Nagygyorgy, K., Kokonyei, G., & Demetrovics, Z. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: an online survey. *Journal of Medical Internet Research, 17*(4), e88. doi:10.2196/jmir.3515

Krahn, D. D., Hasse, S., Ray, A., Gosnell, B., & Drewnowski, A. (1991). Caffeine Consumption in Patients With Eating Disorders. *Psychiatric Services, 42*(3), 313-315.

Launay, G., & Slade, P. (1981). The measurement of hallucinatory predisposition in male and female prisoners. *Personality and Individual Differences, 2*(3), 211 –234.

Lauture, J., & Broderick, P. A. (2014). Coffee is to a Square as Caffeine is to a Rectangle: Part 1. *Journal of Caffeine Research, 4*(2), 33-34. doi:https://doi.org/10.1089/jcr.2014.1239

McKay, R., Langdon, R., & Coltheart, M. (2006). The persecutory ideation questionnaire. *The Journal of Nervous and Mental Disase, 194*(8), 628-631. doi:10.1097/01.nmd.0000231441.48007.a5

Merckelbach, H., & van de Ven, V. (2001). Another White Christmas: Fantasy proneness and reports of ‘ hallucinatory experiences ’ in undergraduate students. *Journal of Behaviour Therapy and Experimental Psychiatry, 32*, 137-144.

Peebles, R., Wilson, J. L., Litt, I. F., Hardy, K. K., Lock, J. D., Mann, J. R., & Borzekowski, D. L. (2012). Disordered eating in a digital age: eating behaviors, health, and quality of life in users of websites with pro-eating disorder content. *Journal of Medical Internet Research, 14*(5), e148. doi:10.2196/jmir.2023

Probst, M., Vandereycken, W., Coppenolle, H. V., & Vanderlinden, J. (1995). The Body Attitude Test for Patients with an Eating Disorder: Psychometric Characteristics of a New Questionnaire. *Eating Disorders, 3*(2), 133-144.

Susánszky, É., Konkoly Thege, B., Stauder, A., & Kopp, M. (2006). A WHO Jól-lét Kérdőív rövidített (WBI-5) magyar változatának validálása a Hungarostudy 2002 országos lakossági egészségfelmérés alapján. [Validation of the short (5-item) version of the WHO Well-being Scale based on a Hungarian representative health survey (Hungarostudy 2002)]. *Mentálhigiéné és Pszichoszomatika, 7*(3), 247-255.

Walker, E. F., & Diforio, D. (1997). Schizophrenia: a neural diathesis-stress model. *Psychological Review, 104*(4), 667-685.

Wicki, M., Kuntsche, E., Eichenberger, Y., Aasvee, K., Bendtsen, P., Dankulincová Veselská, Z., . . . Vieno, A. (2017). Different drinking motives, different adverse consequences? Evidence among adolescents from 10 European countries. *Drug and Alcohol Review, 36*(6), 731-741. doi:10.1111/dar.12572

Wittmann, M., Dinich, J., Merrow, M., & Roenneberg, T. (2006). Social jetlag: misalignment of biological and social time. *Chronobiology International, 23*(1-2), 497-509. doi:10.1080/07420520500545979

Wittmann, M., Paulus, M., & Roenneberg, T. (2010). Decreased psychological well-being in late 'chronotypes' is mediated by smoking and alcohol consumption. *Substance Use and Misuse, 45*(1-2), 15-30. doi:10.3109/10826080903498952