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PATOLOŠKO KOCKANJE – ZAVISNOST ILI POREMEĆAJ KONTROLE IMPULSA?

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Sažetak: Patološko kockanje je najzastupljeniji i najteži oblik nehemijske zavisnosti. Izazovno je svrstati patološko kockanje u samo jednu kategoriju, tj. u poremećaj koji kao glavnu karakteristiku ima impulsivnost ili u bihevioralnu zavisnost, budući da postoje očigledna preklapanja. Imajući gorenavedeno u vidu, ne iznenađuju promene unutar najnovijeg Dijagnostičkog i statističkog priručnika za mentalne poremećaje (DSM-5) i jedanaeste revizije Međunarodne klasifikacije bolesti (MKB-11). Bez obzira što nisu navedeni u okviru dijagnostičkog kriterijuma, impulsivnost i neuropsihološki deficit sastavni su deo poremećaja kockanja. Iz tog razloga, bitni su za potpunije razumevanje profila patoloških kockara. Najsnažniji argumenti koji govore u prilog reklasifikacije patološkog kockanja pod kategoriju zavisnosti su: sličnosti sa dijagnostičkim karakteristikama zavisnosti od psihoaktivnih supstanci (PAS); visok stepen komorbiditeta između ova dva poremećaja; njihova zajednička obeležja koja uključuju i aspekte povezane s sistemom nagrade; otkrića da su iste moždane strukture uključene u oba poremećaja. Postoje sličnosti u načinu reklasifikacije poremećaja kockanja unutar DSM-5 i MKB-11. Kao i u DSM-5, patološko kockanje prepoznato je kao oblik zavisnosti. U MKB-11 je preimenovano u poremećaj kockanja i svrstano u bihevioralne zavisnosti. Najnovije revizije obeju klasifikacija (DSM i MKB) imaju isti razvojni put i suštinski iste osnove, te je jasno uočljiva promena o percepciji kockanja unutar dijagnostike. Patološko kockanje je veoma kompleksna bolest koja je praćena i neuropsihološkim deficitom i impulsivnim ponašanjem, oba karakteristična kako za zavisnike, tako za osobe sa poremećajem kontrole impulsa. Reklasifikacija je značajna i to iz više razloga. Prvo, postoje sličnosti sa dijagnostičkim karakteristikama hemijske zavisnosti. Drugo, postoji visok stepen komorbiditeta između poremećaja kontrole impulsa i bolesti zavisnosti. Treće, oba uključuju sistem nagrade i aktiviraju iste delove mozga. Pretpostavka je da su upravo ove sličnosti dovele do reklasifikacije kako u DSM-5, tako i u MKB-11. Još uvek nije sasvim jasno kako će ova promena o percepciji kockanja unutar dijagnostike uticati na samo lečenje patoloških kockanja.

Ključne reči: patološko kockanje; bihevioralna zavisnost; impulsivnost; MKB klasifikacija; DSM klasifikacija

Uvod

Patološko kockanje je najzastupljeniji i najteži oblik nehemijske zavisnosti. Uzimajući u obzir faktore rizika i posledice patološkog kockanja, ono se uzima kao glavni predstavnik svih nehemijskih zavisnosti. Zavisnosti se često karakterišu kao oblici impulsivnog ponašanja, ali je ovde važno spomenuti da je pojam impulsivnog ponašanja slojevit, te da uključuje različite psihološke domene. Izazovno je svrstati patološko kockanje u samo jednu kategoriju, tj. u poremećaj koji kao glavnu karakteristiku ima impulsivnost ili u bihevioralnu zavisnost, budući da postoje očigledna preklapanja. Istorijski gledano, patološko kockanje je dugo posmatrano kao poremećaj kontrole impulsa, ali

je nedavno reklasifikovano kao bihevioralna zavisnost. Za razliku od hemijskih zavisnosti, kod ovog tipa nije uključena konzumacija supstanci. Javlja se prisila da se čin kockanja ponavlja uprkos tome što ostavlja očigledne negativne posledice na društvenom, porodičnom, profesionalnom i zdravstvenom planu. Imajući gorenavedeno u vidu, ne iznenađuju promene unutar najnovijih klasifikacija. Bez obzira što nisu navedeni u okviru dijagnostičkog kriterijuma, impulsivnost i neuropsihološki deficit sastavni su deo poremećaja kockanja. Iz tog razloga, bitni su za potpunije razumevanje profila patoloških kockara.

PATHOLOGICAL GAMBLING – ADDICTION OR IMPULSE CONTROL DISORDER?

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Summary: Pathological gambling is the most widespread and severe form of non-chemical addiction. It is challenging to categorize pathological gambling into just one category, ie. into a disorder characterized by impulsivity or into behavioral addiction, since there are obvious overlaps. With the above in mind, the changes within the latest Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and the eleventh revision of the International Classification of Diseases (ICD-11) are not surprising. Although not listed in the diagnostic criteria, impulsivity and neuropsychological deficits are an integral part of gambling disorder. For this reason, they are essential for a more complete understanding of the profile of pathological gamblers. The strongest arguments in favor of the reclassification of pathological gambling under the category of addiction are: similarities with the diagnostic characteristics of addiction to psychoactive substances (PAS); high degree of comorbidity between these two disorders; their common features including aspects related to the reward system; findings that the same brain structures are involved in both disorders. There are similarities in the way gambling disorders are reclassified within DSM-5 and ICD-11. As in DSM-5, pathological gambling is recognized as a form of addiction. In ICD-11, it was renamed gambling disorder and classified as behavioral addictions. The latest revisions of both classifications (DSM and ICD) have the same development path and essentially the same foundations, and a change in the perception of gambling within diagnostics is clearly visible. Pathological gambling is a very complex disease that is accompanied by neuropsychological deficits and impulsive behavior, both characteristic of addicts and people with impulse control disorders. Reclassification is significant for several reasons. First, there are similarities with the diagnostic characteristics of chemical addiction. Second, there is a high degree of comorbidity between impulse control disorders and addiction. Third, both involve the reward system and activate the same parts of the brain. It is assumed that these similarities led to the reclassification in both DSM-5 and ICD-11. It is still not entirely clear how this change in the perception of gambling within diagnostics will affect the actual treatment of pathological gambling.

Keywords : pathological gambling; behavioral addiction; impulsiveness; ICD classification; DSM classification

Introduction

Pathological gambling is the most prevalent and severe form of non-chemical addiction. Considering the risk factors and consequences of pathological gambling, it is taken as the main representative of all non-chemical addictions. Addictions are often characterized as forms of impulsive behavior, but it is important to mention here that the concept of impulsive behavior is layered and includes different psychological domains. It is challenging to categorize pathological gambling into just one category, ie. into a disorder characterized by impulsivity or into behavioral addiction, since there are obvious overlaps.

Historically, pathological gambling has long been viewed as an impulse control disorder, but has recently been reclassified as a behavioral addiction. Unlike chemical addictions, this type does not involve substance consumption. There is a compulsion to repeat the act of gambling despite the obvious negative social, family, professional and health consequences. With the above in mind, the changes within the latest classifications are not surprising. Although not listed in the diagnostic criteria, impulsivity and neuropsychological deficits are an integral part of gambling disorder. For this reason, they are essential for a more complete understanding of the profile of pathological gamblers.

Klasifikacija prema DSM

Patološko kockanje je 1980. godine prvi put uvedeno kao zaseban psihijatrijski entitet u trećem izdanju Dijagnostičkog i statističkog priručnika za mentalne poremećaje (DSM-3) Američke psihijatrijske asocijacije (APA) [1]. U narednom izdanju, DSM-4 okarakterisan je kao poremećaj kontrole impulsa neklasifikovan na drugom mestu zajedno sa piromanijom, kleptomanijom i trihotilomanijom [2]. Patološkim kockanjem u okviru DSM-4 se smatra ukoliko su ispunjeni pet ili više od sledećih kriterijuma:

1. preokupiranost kockanjem;
2. potreba da se kocka sa sve većim iznosima u cilju željenog uzbuđenja;
3. postoje raniji neuspešni pokušaji da se kontroliše, smanji i zaustavi kockanje;
4. pokušaj smanjenja kockanja vodi do napetosti i uznemirenosti;
5. kockanje se koristi kao beg od problema i od disforničnog raspoloženja (npr. osećaj nemoći, krivice, anksioznosti, depresije);
6. okretanje kockanju kao načinu povrata prethodno izgubljenog novca;
7. laganje prijatelja, porodice i terapeuta u sklopu minimiziranja problema;
8. pribegavanje kriminalnim delima kao što su falsifikovanje, prevara, krađa ili pronevera u cilju sticanja novca za dalje kockanje;
9. ugrožavanje porodičnih i prijateljskih veza, kao i gubitak posla, obrazovnih i karijernih prilika usled kockanja;
10. oslanjanje na druge radi izlaska iz očajne finansijske situacije uzokovane kockanjem.

Takođe, poslednji kriterijum je da kockanje nije u sklopu manične epizode.

Za razliku od DSM-4, u DSM-5 patološko kockanje se naziva poremećaj kockanja. U petom izdanju ovog priručnika, poremećaj kockanja klasifikovan je zajedno sa poremećajima uslovljenim upotrebom supstanci i prepoznat je kao adiktivni poremećaj nepovezan sa supstancama [3]. U poslednjem priručniku DSM-5 izbačen je kriterijum vezan za činjenje ilegalnih radnji kao što su falsifikovanje, prevare, krađe i pronevera. Budući da je broj kriterijuma smanjen, za postavljanje dijagnoze poremećaja kockanja potrebno je ispunjavanje četiri ili više kriterijuma. Takođe, dat je i vremenski okvir koji mora biti ispunjen, a to je perzistiranje tegoba

poslednjih dvanaest meseci od postavljanja dijagnoze.

Moderna shvatanja patološko kockanje svrstavaju u takozvane bihevioralne zavisnosti. Za sve zavisnosti zajedničko je da aktiviraju sistem nagrade u mozgu koji je uključen u potkrepljivanje ponašanja i stvaranje pamćenja. Kao što psihoaktivne supstance direktno aktiviraju ovaj sistem, bihevioralne zavisnosti to čine putem adaptirajućeg ponašanja. Farmakološki mehanizmi kojima svaka psihoaktivna supstanca dovodi do osećaja prijatnosti su različiti, ali konačno svi ovi mehanizmi deluju na sistem nagrađivanja proizvodeći osećaj zadovoljstva ili euforije [4]. Neurobiološka istraživanja pokazala su kako bihevioralne zavisnosti gotovo jednako deluju na određene neurotransmitterske sisteme kao psihoaktivne supstance, čime je potvrđena hipoteza o njihovim zajedničkim mehanizmima razvoja [4]. Dosadašnja istraživanja pokazuju da su ventralni striatum (dopaminergička neurotransmisija) i ventromedijalni prefrontalni korteks (kontrola impulsa i sistem nagrade) moždane strukture koje bi mogle biti odgovorne za razvijanje žudnje kod zavisnika od kokaina, kao i patoloških kockara [5,6]. Sa farmakoterapijskog gledišta takođe je moguće uvideti sličnost između osoba sa poremećajem kockanja i osoba zavisnih od PAS. Opioidni antagonist naltrekson koji se koristi za lečenje opijatskih zavisnika pokazao je kratkoročnu signifikantnu učinkovitost u smanjivanju žudnje za kockanjem kod patoloških kockara u dve studije sprovedene u Njujorku [7]. Postoje podaci i o upotrebi SSRI, i stabilizatorima raspoloženja u terapiji patološkog kockanja. Ove podatke bi trebalo uzeti sa rezervom s obzirom na nedokazanu efikasnost zbog veličine uzorka, upitne metodologije pojedinih studija, kao i visokog placebo efekta [7]. Pored navedenih činjenica koje patološko kockanje čine bližim zavisnostima od supstanci, postoje i one koje ga udaljavaju od prethodne klasifikacije u sklopu poremećaja kontrole impulsa. Naime, preplavljujući impulsivni nagon koji postoji kod kleptomanije i piromanije i osećaj olakšanja nakon izvršene radnje - nije karakterističan kod patološkog kockanja. Nasuprot tome, sam čin kockanja opisan je kao ugodan, a nelagodnost se javlja nakon gubitka i prekida kockanja [8]. Postoje istraživanja koja pokazuju da osobe zavisne od kockanja imaju velik broj srodnika prvog stepena kojima je dijagnostikovana

Classification according to DSM

In 1980, pathological gambling was first introduced as a separate psychiatric entity in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-3) of the American Psychiatric Association (APA) [1]. In the next edition, DSM-4 characterized it as impulse control disorder not elsewhere classified together with pyromania, kleptomania and trichotillomania [2]. Pathological gambling within DSM-4 is considered if five or more of the following criteria are met:

1. preoccupation with gambling;
2. the need to gamble with increasing amounts in order to achieve the desired excitement;
3. there are previous unsuccessful attempts to control, reduce and stop gambling;
4. trying to reduce gambling leads to tension and anxiety;
5. gambling is used as an escape from problems and from a dysphoric mood (eg feelings of powerlessness, guilt, anxiety, depression);
6. turning to gambling as a way to recover previously lost money;
7. lying to friends, family and therapists as part of minimizing the problem;
8. resorting to criminal acts such as forgery, fraud, theft or embezzlement in order to obtain money for further gambling;
9. jeopardizing family and friendship ties, as well as loss of job, educational and career opportunities due to gambling;
10. relying on others to get out of a desperate financial situation caused by gambling.

Also, the last criterion is that the gambling is not part of the manic episode.

Unlike DSM-4, in DSM-5 pathological gambling is called gambling disorder. In the fifth edition of this manual, gambling disorder was classified together with substance use disorders and recognized as a non-substance addictive disorder [3]. In the latest DSM-5 manual, criteria related to committing illegal acts such as forgery, fraud, theft and embezzlement were removed. Since the number of criteria is reduced, four or more criteria must be met to establish a diagnosis of gambling disorder. Also, a time frame that must be met is given, which is

the persistence of complaints for the last twelve months since the diagnosis.

Modern understandings classify pathological gambling as a so-called behavioral addiction. All addictions have in common that they activate the brain's reward system, which is involved in reinforcing behavior and creating memories. Just as psychoactive substances directly activate this system, behavioral addictions do so through adaptive behavior. The pharmacological mechanisms by which each psychoactive substance leads to a feeling of pleasure are different, but ultimately all of these mechanisms act on the reward system producing a feeling of pleasure or euphoria [4]. Neurobiological research has shown that behavioral addictions act almost equally on certain neurotransmitter systems as psychoactive substances, thus confirming the hypothesis of their common development mechanisms [4]. Current research shows that the ventral striatum (dopaminergic neurotransmission) and ventromedial prefrontal cortex (impulse control and reward system) are brain structures that could be responsible for the development of craving in cocaine addicts as well as pathological gamblers [5,6]. From a pharmacotherapeutic point of view, it is also possible to see the similarity between persons with gambling disorder and persons addicted to PAS. The opioid antagonist naltrexone used to treat opiate addicts has shown short-term significant efficacy in reducing the urge to gamble in pathological gamblers in two studies conducted in New York [7]. There are data on the use of SSRIs and mood stabilizers in the treatment of pathological gambling. These data should be taken with a grain of salt considering the unproven efficacy due to the sample size, the questionable methodology of individual studies, as well as the high placebo effect [7]. In addition to the above facts that make pathological gambling closer to substance addiction, there are also those that distance it from the previous classification as part of impulse control disorders. Namely, the overwhelming impulsive drive that exists in kleptomania and pyromania and the feeling of relief after the action is performed - is not characteristic of pathological gambling. In contrast, the act of gambling itself is described as pleasurable, and discomfort occurs after a loss and cessation of gambling [8]. There are studies that show that people addicted to gambling have a large number of first-degree

zavisnost od različitih PAS [9]. Ova činjenica bi mogla ići u prilog genetskom uticaju patološkog kockanja i zavisnosti od PAS. Najsnažniji argumenti koji govore u prilog reklasifikacije patološkog kockanja pod kategoriju zavisnosti su: sličnosti sa dijagnostičkim karakteristikama zavisnosti od PAS; visok stepen komorbiditeta između ova dva poremećaja; njihova zajednička obeležja koja uključuju i aspekte povezane s sistemom nagrade; otkrića da su iste moždane strukture uključene u oba poremećaja. Takođe, istraživanja o kompulzivnosti sugerišu ove sličnosti, naročito u kasnijim fazama poremećaja [10]. Sve je veći broj činjenica koji ukazuju na sličnost između patološkog kockanja i zavisnosti od PAS. Pretpostavka je da je upravo to i dovelo do njegove reklasifikacije u DSM-5, a po svemu sudeći i u MKB-11.

Klasifikacija prema MKB

Što se tiče desete revizije Međunarodne klasifikacije bolesti (MKB-10) koja je aktuelno važeća na našim prostorima, patološko kockanje (F63.0) klasifikovano je kao poremećaj navika i impulsa, zajedno sa kleptomanijom, piromanijom i trihotilomanijom [11]. Bez jasno taksativno navedenih dijagnostičkih kriterijuma, osnovna karakteristika patološkog kockanja je perzistirajuće ponavljanje kockanja koje se nastavlja i često pojačava uprkos ozbiljnim socijalnim posledicama kao što su osiromašenje, poremećeni porodični odnosi i poremećaj ličnog života. Takođe, važno je razlikovati patološko kockanje od kockanja i opklade, ekscitativnog kockanja maničnih pacijenata i kockanja sociopatskih ličnosti.

Jedanaesta revizija Međunarodne klasifikacije bolesti (MKB-11) [12] dovela je do nekoliko novina kojim dolazi do približavanja MKB i DSM klasifikacije. Poremećaj kockanja (6C50) unutar MKB-11 svrstan je u bihevioralne zavisnosti zajedno sa zavisnostima od psihoaktivnih supstanci. Ova promena je značajna budući da termin bihevioralne zavisnosti do sada nije korišćen ni u jednoj od MKB i DSM klasifikacija. U istu grupu bihevioralnih zavisnosti prvi put je svrstan i poremećaj igranja video igrice ("gejming" poremećaj). Takođe oba poremećaja su subklasifikovana na onlajn i oflajn poremećaje pri čemu onlajn podrazumeva kockanje putem interneta ili sličnih mreža, dok se oflajn ispoljava u realnom svetu. Unutar MKB-11, data je opisna definicija kojom je poremećaj kockanja okarakterisan perzistentnim ili

rekurentnim ponašanjem koje uključuje kockanje koje može biti onlajn (6C50.1), oflajn (6C50.0) ili nespecificovano (6C50.Z). Jasno su data tri kriterijuma koja moraju biti ispunjena za postavljanje dijagnoze poremećaja kockanja [12]:

Perzistentan obrazac ponašanja kockanja koje može biti onlajn ili oflajn, i manifestuje se na sledeći način:

Nedostatak kontrole nad ponašanjem u vezi sa kockanjem (npr. početak kockanja, učestalost, intenzitet, trajanje, završetak, kontekst);

Organizovanje životnih prioriteta tako da se kockanje nalazi na samom vrhu lestvice, pri čemu ostali životni interesi i aktivnosti postaju manje važni;

Nastavak kockanja ili njegova eskalacija uprkos negativnim posledicama (npr. sukobi unutar bračne zajednice, značajni finansijski gubici, negativan uticaj na zdravlje).

Obrazac kockarskog ponašanja može biti kontinuiran ili epizodičan i rekurentan, ali se uvek manifestuje kroz duži vremenski period (npr. 12 meseci). Kockarsko ponašanje ne manifestuje se u sklopu drugog mentalnog poremećaja (npr. manične epizode) niti je posledica uzimanja supstance ili lekova.

Obrazac kockarskog ponašanja dovodi do značajnog distresa ili pogoršanja na ličnom, porodičnom, društvenom, obrazovnom, karijernom planu, kao i na drugim životnim poljima.

Kao što smo pomenuli, postoje sličnosti u načinu reklasifikacije poremećaja kockanja unutar DSM-5 i MKB-11. Kao i u DSM-5, patološko kockanje prepoznato je kao oblik zavisnosti. U MKB-11 je preimenovano u poremećaj kockanja i svrstano u bihevioralne zavisnosti.

Najnovije revizije obeju klasifikacija (DSM i MKB) imaju isti razvojni put i suštinski iste osnove, te je jasno uočljiva promena o percepciji kockanja unutar dijagnostike.

Impulsivnost i neuropsihološki deficit kod patološkog kockanja u poređenju sa zavisnicima od PAS

Impulsivno ponašanje najčešće se javlja kod specifičnih psihijatrijskih poremećaja kao što su hiperkinetski poremećaj (ADHD), granični i disocijativni poremećaj ličnosti, zavisnost od PAS, manija, kao i patološko kockanje [13]. Impulsivnost se sastoji iz najmanje dve dimenzije: dezinhibicije (ili impulsivne akcije), i impulsivnog donošenja odluka (ili impulsivnih

relatives diagnosed with addiction to various PAS [9]. This fact could support the genetic influence of pathological gambling and PAS addiction. The strongest arguments in favor of the reclassification of pathological gambling under the category of addiction are: similarities with the diagnostic characteristics of PAS addiction; high degree of comorbidity between these two disorders; their common features including aspects related to the reward system; findings that the same brain structures are involved in both disorders. Also, research on compulsivity suggests these similarities, especially in the later stages of the disorder [10]. There is an increasing number of facts that point to the similarity between pathological gambling and PAS addiction. The assumption is that this is exactly what led to its reclassification in DSM-5, and apparently also in ICD-11.

Classification according to ICD

Regarding the tenth revision of the International Classification of Diseases (ICD-10), which is currently valid in our region, pathological gambling (F63.0) is classified as a disorder of habits and impulses, together with kleptomania, pyromania and trichotillomania [11]. Without clearly defined diagnostic criteria, the basic characteristic of pathological gambling is persistent repetition of gambling that continues and often increases despite serious social consequences such as impoverishment, disturbed family relationships and disruption of personal life. Also, it is important to distinguish pathological gambling from gambling and betting, excessive gambling of manic patients and gambling of sociopathic personalities. The eleventh revision of the International Classification of Diseases (ICD-11) [12] led to several novelties that brought the ICD and DSM classification closer together. Gambling disorder (6C50) within ICD-11 is classified under behavioral addictions together with addictions to psychoactive substances. This change is significant since the term behavioral addiction has not been used in any of the ICD and DSM classifications until now. For the first time, the disorder of playing video games ("gaming" disorder) was included in the same group of behavioral addictions. Also, both disorders are subclassified into online and offline disorders, where online involves gambling via the Internet or similar networks, while offline manifests itself in the real world. Within ICD-11, a descriptive

definition is given that gambling disorder is characterized by persistent or recurrent behavior involving gambling that may be online (6C50.1), offline (6C50.0) or unspecified (6C50.Z). There are clearly three criteria that must be met for the diagnosis of gambling disorder [12]:

A persistent pattern of gambling behavior that can be online or offline, and manifests as follows:

Lack of control over gambling behavior (eg gambling initiation, frequency, intensity, duration, termination, context);

Organizing life priorities so that gambling is at the very top of the ladder, while other life interests and activities become less important;

Continuation or escalation of gambling despite negative consequences (eg, marital conflict, significant financial losses, negative impact on health).

The pattern of gambling behavior can be continuous or episodic and recurrent, but always manifests itself over a longer period of time (eg 12 months). Gambling behavior is not manifested as part of another mental disorder (eg manic episode) nor is it a consequence of taking a substance or medication.

A pattern of gambling behavior leads to significant distress or deterioration in personal, family, social, educational, career, and other areas of life.

As mentioned, there are similarities in the way gambling disorders are reclassified within DSM-5 and ICD-11. As in DSM-5, pathological gambling is recognized as a form of addiction. In ICD-11, it was renamed gambling disorder and classified as behavioral addictions.

The latest revisions of both classifications (DSM and ICD) have the same development path and essentially the same foundations, and a change in the perception of gambling within diagnostics is clearly visible.

Impulsivity and neuropsychological deficits in pathological gambling compared to PAS addicts

Impulsive behavior most often occurs in specific psychiatric disorders such as hyperkinetic disorder (ADHD), borderline and dissociative personality disorder, PAS addiction, mania, and pathological gambling [13]. Impulsivity consists of at least two dimensions: disinhibition (or impulsive action), and impulsive decision-making (or impulsive

izbora).[14] U pitanju je kompleksno ponašanje koje karakteriše i niža senzitivnost za negativne posledice ponašanja, neadekvatna senzorna obrada stimulusa, sklonost ka preferiranju trenutnog nagrađivanja u poređenju sa vrednijim ali odloženim nagradama, rizično ponašanje pri donošenju odluka, kao i pridržavanje ponašanju koje je štetno ili kažnjivo [15]. Iako impulsivnost nije eksplicitno navedena kao simptom poremećaja povezanim sa upotrebom PAS u DSM i MKB klasifikacijama, mnoge teorije sugerišu da impulsivnost utiče i vodi ka progresiji zavisnosti. Pored toga, impulsivnost se može povezati sa većom verovatnoćom počinjanja sa upotrebom PAS, rapidnom eskalacijom korišćenja, nemogućnošću da se smanji ili prekine upotreba, kao i sa većom verovatnoćom recidiva uprkos motivaciji da se održi apstinencija [16]. Istraživanja su pokazala da zavisnici od PAS (preciznije heroinski zavisnici) imaju izrazitu sklonost ka vrednovanju trenutne dobiti nasuprot dugoročnim. Zanimljivo je da su patološki kockari ispoljili jednako ponašanje i sličan kognitivni profil zavisnicima [17]. Pored toga, meta-analiza grupe američkih naučnika utvrdila je da patološke kockare kod kojih ne postoji komorbiditet zloupotrebe supstanci, karakteriše motorna impulsivnost, što je utvrđeno kako na bihevioralnom nivou, tako i metodom samoprocene. Ovim se može zaključiti da je u pitanju jedan element njihove psihopatologije koji hrani potrebu za kockanjem uprkos negativnim posledicama [18].

Kognitivne distorzije sastavni su deo poremećaja kockanja, ali nisu dijagnostički kriterijum, uprkos činjenici da se mogu tretirati kao prediktor problema sa kockanjem [19]. Jedan od najreprezentativnijih oblika kognitivne distorzije kod patoloških kockara jeste tzv. iluzija kontrole. Ovu frazu je skovala Elen Langer i definisala kao iščekivanje uspeha iako su šanse za uspeh objektivno manje verovatne od pretpostavljenog [20]. Pored iluzije kontrole, druge kognitivne distorzije uključuju i poseban oblik prediktivne kontrole (verovanje da je moguće predvideti ishod budućih kockanja analizom prethodnih obrazaca) i sklonost ka pozitivnoj interpretaciji prethodnih iskustava tako da idu u korist odluci da se sa praksom kockanja nastavi [21].

Izučavanjem studija o poremećajima uslovljenim korišćenjem PAS, uočena je paralela sa kognitivnim distorzijama kod patoloških

kockara: postoje očekivanja u vezi sa iskustvom kockanja, tj. uverenje da će kockanje učiniti da se osoba oseti bolje, i nemogućnost prestanka kockanja, tj. gubitak kontrole [22]. Upravo je jedan od kriterijuma za dijagnostikovanje zavisnosti od PAS prema MKB-10 gubitak kontrole nad uzimanjem supstance i nemogućnost prestanka.

Mnoge studije 21. veka ukazuju na deficit egzekutivnih funkcija kod patoloških kockara. Egzekutivne funkcije podrazumevaju skup procesa koji omogućavaju upravljanje sobom i raspoloživim resursima zarad postizanja određenog cilja. Tu spadaju inhibicija, kontrola emocija, inicijacija, radna memorija, samokontrola, apstraktno mišljenje, rešavanje problema, organizacione sposobnosti, razumevanje pravila i kategorizacija. Disfunkcionalnost u pogledu planiranja [23], smanjena kognitivna fleksibilnost [24], kao i nedostatak bihevioralne inhibicije [24,25,26,27] opisane su u niz različitih istraživanja. Takođe, ostvareni učinak na IGT (Iowa Gambling Task) testu koji je osmišljen za procenu kapaciteta donošenja odluka, pokazao je da postoji deficit kod patoloških kockara [23,28,29]. Poremećaj kockanja karakteriše i niska samokontrola, što se smatra povezanim sa deficitima egzekutivnih funkcija. Dakle, psihička "kratkovidost" za posledice delovanja i ono što se može dogoditi u budućnosti često je deo profila patološkog kockara [30].

Istraživanja su dokazala neuropsihološki deficit kod zavisnika od PAS i upravo zbog ovog deficita, zavisnici kontinuirano nastavljaju sa konzumiranjem supstanci i imaju poteškoća da održe apstinenciju (ukoliko započnu lečenje). Primera radi, jedna studija pokazala je da 68% ispitanika u grupi zavisnika od PAS iskazuje deficit u egzekutivnim funkcijama, dok je ovaj procenat 3% u okviru kontrolne grupe [31]. Deficit u pogledu kognitivne fleksibilnosti primećeni su naročito kod opijatskih i zavisnika od kokaina, deficit pažnje i kontrole impulsa kod amfetaminskih zavisnika, deficit u pogledu kognitivne fleksibilnosti i pažnje kod korisnika kanabisa, dok je kod pušača u najvećoj meri primećen poremećaj pamćenja i učenja [32]. Uprkos tome što impulsivnost i kognitivni deficit nisu deo dijagnostike u okviru klasifikacija, ne možemo ih zanemariti s obzirom na njihovu učestalost kod patoloških kockara.

choices).[14] It is a complex behavior characterized by lower sensitivity to the negative consequences of behavior, inadequate sensory processing of stimuli, a tendency to prefer immediate rewards compared to more valuable but delayed rewards, risky behavior when making decisions, as well as adherence to harmful or punishable behavior [15]. Although impulsivity is not explicitly listed as a symptom of PAS use disorders in the DSM and ICD classifications, many theories suggest that impulsivity influences and leads to the progression of addiction. In addition, impulsivity may be associated with greater likelihood of initiation of PAS use, rapid escalation of use, inability to reduce or stop use, and greater likelihood of relapse despite motivation to maintain abstinence [16]. Research has shown that PAS addicts (more specifically heroin addicts) have a strong tendency to value immediate gains over long-term ones. Interestingly, pathological gamblers exhibited the same behavior and a similar cognitive profile to addicts [17]. In addition, a meta-analysis by a group of American scientists found that pathological gamblers without substance abuse comorbidity are characterized by motor impulsivity, which was determined both at the behavioral level and by the self-report method. This can be concluded that it is an element of their psychopathology that feeds the need to gamble despite the negative consequences [18].

Cognitive distortions are an integral part of gambling disorders, but they are not a diagnostic criterion, despite the fact that they can be treated as a predictor of gambling problems [19]. One of the most representative forms of cognitive distortion in pathological gamblers is the so-called the illusion of control. This phrase was coined by Ellen Langer and defined as the expectation of success even though the chances of success are objectively less likely than assumed [20]. In addition to the illusion of control, other cognitive distortions include a special form of predictive control (the belief that it is possible to predict the outcome of future gambling by analyzing previous patterns) and the tendency to positively interpret previous experiences in a way that favors the decision to continue gambling [21].

By examining studies on disorders conditioned by the use of PAS, a parallel was observed with cognitive distortions in pathological gamblers: there are expectations

related to the gambling experience, i.e. the belief that gambling will make the person feel better, and the inability to stop gambling, i.e. loss of control [22]. One of the criteria for diagnosing PAS addiction according to ICD-10 is the loss of control over taking the substance and the inability to stop.

Many 21st century studies point to a deficit of executive functions in pathological gamblers. Executive functions include a set of processes that enable self-management and available resources to achieve a specific goal. These include inhibition, emotion control, initiation, working memory, self-control, abstract thinking, problem solving, organizational skills, understanding rules, and categorization. Dysfunctionality in terms of planning [23], reduced cognitive flexibility [24], as well as lack of behavioral inhibition [24,25,26,27] have been described in a number of different studies. Also, the achieved performance on the IGT (Iowa Gambling Task) test, which was designed to assess decision-making capacity, showed that there is a deficit in pathological gamblers [23,28,29]. Gambling disorder is also characterized by low self-control, which is thought to be related to executive function deficits. Thus, psychological "myopia" for the consequences of actions and what may happen in the future is often part of the profile of a pathological gambler [30].

Research has proven a neuropsychological deficit in PAS addicts, and precisely because of this deficit, addicts continue to consume substances and have difficulty maintaining abstinence (if they start treatment). For example, one study showed that 68% of respondents in the group of PAS addicts showed a deficit in executive functions, while this percentage was 3% within the control group [31]. A deficit in terms of cognitive flexibility was observed especially in opiate and cocaine addicts, a deficit in attention and impulse control in amphetamine addicts, a deficit in terms of cognitive flexibility and attention in cannabis users, while memory and learning disorders were observed to the greatest extent in smokers [32]. Despite the fact that impulsivity and cognitive deficit are not part of the diagnosis within the classifications, we cannot ignore them considering their frequency in pathological gamblers.

ZAKLJUČAK

Poremećaj kockanja je često zanemaren problem javnog zdravlja zbog visoke zastupljenosti i posledica koje uzrokuje kako po individuu, tako i po društvo. Posmatrajući najnoviju literaturu, prevalenca patološkog kockanja na globalnom nivou iznosi između 0,5% i 3% dok se procenjuje da je između tri do četiri puta veća zastupljenost kockanja na subkliničkom nivou [33], što govori o veličini i kompleksnosti problema kockanja. Zavisnost se često dovodi u direktnu vezu sa impulsivnošću. Impulsivno ponašanje je obeleženo kao indikator potencijalnog korišćenja supstanci, kao i progresije ka opasnijoj i učestalijoj konzumaciji. Patološko kockanje i zavisnost od supstanci imaju neporecive sličnosti kada posmatramo nastajanje i razvoj bolesti, komorbiditete, pa čak i etiologiju. Stoga ne iznenađuje nova klasifikacija unutar DSM-5 i MKB-11 koja poremećaj kockanja svrstava u grupu zavisnosti i kategoriše kao bihejvioralnu zavisnost. Sama promena imena u poremećaj kockanja se u literaturi objašnjava kao pokušaj redukovanja stigme koju prati izraz "patološko" [34]. Kada je reč o reklasifikaciji i argumentima

za i protiv, nemoguće je dati konačan sud. Patološko kockanje je veoma kompleksna bolest koja je praćena i neuropsihološkim deficitom i impulsivnim ponašanjem, oba karakteristična kako za zavisnike, tako za osobe sa poremećajem kontrole impulsa. Uzimajući u obzir visoka preklapanja, izazov je posmatrati kockanje samo unutar jedne od kategorija. Ipak je reklasifikacija značajna i to iz više razloga. Prvo, postoje sličnosti sa dijagnostičkim karakteristikama hemijske zavisnosti. Drugo, postoji visok stepen komorbiditeta između poremećaja kontrole impulsa i bolesti zavisnosti. Treće, oba uključuju sistem nagrade i aktiviraju iste delove mozga. Pretpostavka je da su upravo ove sličnosti dovele do reklasifikacije kako u DSM-5, tako i u MKB-11. Još uvek nije sasvim jasno kako će ova promena o percepciji kockanja unutar dijagnostike uticati na samo lečenje patoloških kockanja.

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LITERATURA:

- Pichot P. DSM-III: the 3d edition of the Diagnostic and Statistical Manual of Mental Disorders from the American Psychiatric Association. *Revue neurologique*. 1986 Jan 1;142(5):489-99.
- Bell CC. DSM-IV: diagnostic and statistical manual of mental disorders. *Jama*. 1994 Sep 14;272(10):828-9.
- American Psychiatric Association. DSM 5 diagnostic and statistical manual of mental disorders. 2013 (pp. 947-p).
- Bodor D. Usporedba psihosocijalnoga funkcioniranja osoba koje se liječe zbog ovisnosti o kockanju i alkoholu (Doctoral dissertation, University of Zagreb. School of Dental Medicine. Chair of Psychiatry and Medical Psychology), 2018.
- Yargic I. Biological mechanisms underlying addiction. *Int J Hum Health Sci (IJHHS)* [Internet]. 2018;2(3):107. Available from: <http://dx.doi.org/10.31344/ijhhs.v2i3.37>
- Clark L, Boileau I, Zack M. Neuroimaging of reward mechanisms in Gambling disorder: an integrative review. *Molecular psychiatry*. 2019 May;24(5):674-93.
- Hollander E, Sood E, Pallanti S, Baldini-Rossi N, Baker B. Pharmacological treatments of pathological gambling. *Journal of gambling studies*. 2005 Mar;21(1):99-108.
- Fauth-Bühler M, Mann K, Potenza MN. Pathological gambling: a review of the neurobiological evidence relevant for its classification as an addictive disorder. *Addiction biology*. 2017 Jul;22(4):885-97.
- Grant JE, Chamberlain SR. Family History of Substance Use Disorders: Significance for Mental Health in Young Adults Who Gamble. *JOURNAL OF BEHAVIORAL ADDICTIONS*. 2020;9(2):289-97.
- Fauth-Bühler M, Mann K, Potenza MN. Pathological gambling: a review of the neurobiological evidence relevant for its classification as an addictive disorder. *Addiction biology*. 2017 Jul;22(4):885-97.
- ICD-10 Classification of Mental and Behavioural Disorders. Geneva, World Health Organization, 1992. (Svetska zdravstvena organizacija. ICD-10. Klasifikacija mentalnih poremećaja i poremećaja ponašanja. Izdavač srpskog prevoda Zavod za udžbenike i nastavna sredstva, Beograd, 1992.)
- World Health Organization. ICD-11 for mortality and morbidity statistics (2018).
- Batinić B, Duišin D, Vukosavljević-Gvozden T. Neurobiološke osnove impulsivnog i kompulzivnog ponašanja-implikacije za farmakološke i psihološke intervencije. *Engrami*. 2017;39(1):17-32.
- Cavicchioli M, Movalli M, Bruni A, Terragni R, Bellintani S, Ricchiuti A, Borgia E, Borelli G, Elena GM, Piazza L, Begarani M. The Complexity of Impulsivity Dimensions among Abstinent Individuals with Substance Use Disorders. *Journal of Psychoactive Drugs*. 2022 Aug 25:1-2.
- MacKillop J, Weafer J, C Gray J, Oshri A, Palmer A, de Wit H. The latent structure of impulsivity: impulsive choice, impulsive action, and impulsive personality traits. *Psychopharmacology*. 2016 Sep;233(18):3361-70.
- Kozak K, Lucatch AM, Lowe DJ, Balodis IM, MacKillop J, George TP. The neurobiology of impulsivity and substance use disorders: implications for treatment. *Annals of the New York Academy of Sciences*. 2019 Sep;1451(1):71-91.
- Banich MT, Compton RJ. *Cognitive neuroscience*. Cambridge University Press; 2018 Apr 5.

CONCLUSION

Gambling disorder is an often neglected public health problem due to its high prevalence and the consequences it causes both for the individual and for society. Looking at the latest literature, the global prevalence of pathological gambling is between 0.5% and 3%, while the prevalence of subclinical gambling is estimated to be three to four times higher [33], which speaks to the magnitude and complexity of the gambling problem. Addiction is often directly linked to impulsivity. Impulsive behavior is marked as an indicator of potential substance use, as well as a progression towards more dangerous and frequent consumption. Pathological gambling and substance dependence have undeniable similarities when looking at the onset and development of the disease, comorbidities, and even etiology. Therefore, it is not surprising that the new classification within DSM-5 and ICD-11 places gambling disorder in the addiction group and categorizes it as a behavioral addiction. The very name change to gambling disorder is explained in the literature as an attempt to reduce the stigma associated with the term "pathological" [34]. When it comes to reclassification and

arguments for and against, it is impossible to make a final judgment. Pathological gambling is a very complex disease that is accompanied by neuropsychological deficits and impulsive behavior, both characteristic of addicts and people with impulse control disorders. Given the high overlap, it is challenging to look at gambling within just one of the categories. Nevertheless, the reclassification is significant for several reasons. First, there are similarities with the diagnostic characteristics of chemical addiction. Second, there is a high degree of comorbidity between impulse control disorders and addiction. Third, both involve the reward system and activate the same parts of the brain. It is assumed that these similarities led to the reclassification in both DSM-5 and ICD-11. It is still not entirely clear how this change in the perception of gambling within diagnostics will affect the actual treatment of pathological gambling.

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LITERATURE :

- Pichot P. DSM-III: the 3d edition of the Diagnostic and Statistical Manual of Mental Disorders from the American Psychiatric Association. *Revue neurologique*. 1986 Jan 1;142(5):489-99.
- Bell CC. DSM-IV: diagnostic and statistical manual of mental disorders. *Jama*. 1994 Sep 14;272(10):828-9.
- American Psychiatric Association. DSM 5 diagnostic and statistical manual of mental disorders. 2013 (pp. 947-p).
- Bodor D. Usporedba psihosocijalnoga funkcioniranja osoba koje se liječe zbog ovisnosti o kockanju i alkoholu (Doctoral dissertation, University of Zagreb. School of Dental Medicine. Chair of Psychiatry and Medical Psychology), 2018.
- Yargic I. Biological mechanisms underlying addiction. *Int J Hum Health Sci (IJHHS)* [Internet]. 2018;2(3):107. Available from: <http://dx.doi.org/10.31344/ijhhs.v2i3.37>
- Clark L, Boileau I, Zack M. Neuroimaging of reward mechanisms in Gambling disorder: an integrative review. *Molecular psychiatry*. 2019 May;24(5):674-93.
- Hollander E, Sood E, Pallanti S, Baldini-Rossi N, Baker B. Pharmacological treatments of pathological gambling. *Journal of gambling studies*. 2005 Mar;21(1):99-108.
- Fauth-Bühler M, Mann K, Potenza MN. Pathological gambling: a review of the neurobiological evidence relevant for its classification as an addictive disorder. *Addiction biology*. 2017 Jul;22(4):885-97.
- Grant JE, Chamberlain SR. Family History of Substance Use Disorders: Significance for Mental Health in Young Adults Who Gamble. *JOURNAL OF BEHAVIORAL ADDICTIONS*. 2020;9(2):289-97.
- Fauth-Bühler M, Mann K, Potenza MN. Pathological gambling: a review of the neurobiological evidence relevant for its classification as an addictive disorder. *Addiction biology*. 2017 Jul;22(4):885-97.
- ICD-10 Classification of Mental and Behavioural Disorders. Geneva, World Health Organization, 1992. (Svetska zdravstvena organizacija. ICD-10. Klasifikacija mentalnih poremećaja i poremećaja ponašanja. Izdavač srpskog prevoda Zavod za udžbenike i nastavna sredstva, Beograd, 1992.)
- World Health Organization. ICD-11 for mortality and morbidity statistics (2018).
- Batinić B, Duišin D, Vukosavljević-Gvozden T. Neurobiološke osnove impulsivnog i kompulzivnog ponašanja-implikacije za farmakološke i psihološke intervencije. *Engrami*. 2017;39(1):17-32.
- Cavicchioli M, Movalli M, Bruni A, Terragni R, Bellintani S, Ricchiuti A, Borgia E, Borelli G, Elena GM, Piazza L, Begarani M. The Complexity of Impulsivity Dimensions among Abstinent Individuals with Substance Use Disorders. *Journal of Psychoactive Drugs*. 2022 Aug 25:1-2.
- MacKillop J, Weafer J, C Gray J, Oshri A, Palmer A, de Wit H. The latent structure of impulsivity: impulsive choice, impulsive action, and impulsive personality traits. *Psychopharmacology*. 2016 Sep;233(18):3361-70.
- Kozak K, Lucatch AM, Lowe DJ, Balodis IM, MacKillop J, George TP. The neurobiology of impulsivity and substance use disorders: implications for treatment.

18. Chowdhury NS, Livesey EJ, Blaszczynski A, Harris JA. Pathological gambling and motor impulsivity: a systematic review with meta-analysis. *Journal of gambling studies*. 2017 Dec;33(4):1213-39.
19. Goodie AS, Fortune EE, Shotwell JJ. Cognitive distortions in disordered gambling. In *Gambling disorder 2019* (pp. 49-71). Springer, Cham.
20. Eben C, Chen Z, Billieux J, Verbruggen F. Outcome sequences and illusion of control-Part I: An online replication of Langer & Roth (1975). *International Gambling Studies*. 2022 Nov 9:1-2.
21. Ledgerwood DM, Dyshniku F, McCarthy JE, Ostojic-Aitkens D, Forfitt J, Rumble SC. Gambling-related cognitive distortions in residential treatment for gambling disorder. *Journal of Gambling Studies*. 2020 Jun;36(2):669-83.
22. Nigro G, Ciccarelli M, Cosenza M. The illusion of handy wins: Problem gambling, chasing, and affective decision-making. *Journal of affective disorders*. 2018 Jan 1;225:256-9.
23. Ledgerwood DM, Orr ES, Kaploun KA, Milosevic A, Frisch GR, Rupcich N, Lundahl LH. Executive function in pathological gamblers and healthy controls. *Journal of Gambling Studies*. 2012 Mar;28(1):89-103.
24. Odlaug BL, Chamberlain SR, Kim SW, Schreiber LR, Grant JE. A neurocognitive comparison of cognitive flexibility and response inhibition in gamblers with varying degrees of clinical severity. *Psychological medicine*. 2011 Oct;41(10):2111-9.
25. Grant JE, Odlaug BL, Chamberlain SR, Schreiber LR. Neurocognitive dysfunction in strategic and non-strategic gamblers. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2012 Aug 7;38(2):336-40.
26. Kalechstein AD, Fong T, Rosenthal RJ, Davis A, Vanyo H, Newton TF. Pathological gamblers demonstrate frontal lobe impairment consistent with that of methamphetamine-dependent individuals. *The Journal of neuropsychiatry and clinical neurosciences*. 2007 Jul;19(3):298-303.
27. Roca M, Torralva T, López P, Cetkovich M, Clark L, Manes F. Executive functions in pathologic gamblers selected in an ecologic setting. *Cognitive and Behavioral Neurology*. 2008 Mar 1;21(1):1-4.
28. Brevers D, Cleeremans A, Goudriaan AE, Bechara A, Kornreich C, Verbanck P, Noël X. Decision making under ambiguity but not under risk is related to problem gambling severity. *Psychiatry research*. 2012 Dec 30;200(2-3):568-74.
29. Mallorquí-Bagué N, Fagundo AB, Jimenez-Murcia S, De La Torre R, Baños RM, Botella C, Casanueva FF, Crujeiras AB, Fernández-García JC, Fernández-Real JM, Frühbeck G. Decision making impairment: a shared vulnerability in obesity, gambling disorder and substance use disorders?. *PLoS One*. 2016 Sep 30;11(9):e0163901.
30. Verdejo-García A, Alcázar-Córcoles MA, Albein-Urios N. Neuropsychological interventions for decision-making in addiction: a systematic review. *Neuropsychology Review*. 2019 Mar;29(1):79-92.
31. Al Hakeem M, Chowdhury KU. Executive functions of people with drug addiction. *Dhaka University Journal of Biological Sciences*. 2020 Jan 10;29(1):27-36.
32. Gupta A, Murthy P, Rao S. Brief screening for cognitive impairment in addictive disorders. *Indian Journal of Psychiatry*. 2018 Feb;60(Suppl 4):S451.
33. Abbott MW. The changing epidemiology of gambling disorder and gambling-related harm: public health implications. *Public health*. 2020 Jul 1;184:41-5.
34. Grant JE, Chamberlain SR. Gambling disorder and its relationship with substance use disorders: Implications for nosological revisions and treatment. *The American Journal on Addictions*. 2015 Mar;24(2):126-31.

- Annals of the New York Academy of Sciences. 2019 Sep;1451(1):71-91.
17. Banich MT, Compton RJ. Cognitive neuroscience. Cambridge University Press; 2018 Apr 5.
 18. Chowdhury NS, Livesey EJ, Blaszczyński A, Harris JA. Pathological gambling and motor impulsivity: a systematic review with meta-analysis. *Journal of gambling studies*. 2017 Dec;33(4):1213-39.
 19. Goodie AS, Fortune EE, Shotwell JJ. Cognitive distortions in disordered gambling. In *Gambling disorder 2019* (pp. 49-71). Springer, Cham.
 20. Eben C, Chen Z, Billieux J, Verbruggen F. Outcome sequences and illusion of control-Part I: An online replication of Langer & Roth (1975). *International Gambling Studies*. 2022 Nov 9:1-2.
 21. Ledgerwood DM, Dyshniku F, McCarthy JE, Ostojic-Aitkens D, Forfitt J, Rumble SC. Gambling-related cognitive distortions in residential treatment for gambling disorder. *Journal of Gambling Studies*. 2020 Jun;36(2):669-83.
 22. Nigro G, Ciccarelli M, Cosenza M. The illusion of handy wins: Problem gambling, chasing, and affective decision-making. *Journal of affective disorders*. 2018 Jan 1;225:256-9.
 23. Ledgerwood DM, Orr ES, Kaploun KA, Milosevic A, Frisch GR, Rucpich N, Lundahl LH. Executive function in pathological gamblers and healthy controls. *Journal of Gambling Studies*. 2012 Mar;28(1):89-103.
 24. Odlaug BL, Chamberlain SR, Kim SW, Schreiber LR, Grant JE. A neurocognitive comparison of cognitive flexibility and response inhibition in gamblers with varying degrees of clinical severity. *Psychological medicine*. 2011 Oct;41(10):2111-9.
 25. Grant JE, Odlaug BL, Chamberlain SR, Schreiber LR. Neurocognitive dysfunction in strategic and non-strategic gamblers. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2012 Aug 7;38(2):336-40.
 26. Kalechstein AD, Fong T, Rosenthal RJ, Davis A, Vanyo H, Newton TF. Pathological gamblers demonstrate frontal lobe impairment consistent with that of methamphetamine-dependent individuals. *The Journal of neuropsychiatry and clinical neurosciences*. 2007 Jul;19(3):298-303.
 27. Roca M, Torralva T, López P, Cetkovich M, Clark L, Manes F. Executive functions in pathologic gamblers selected in an ecologic setting. *Cognitive and Behavioral Neurology*. 2008 Mar 1;21(1):1-4.
 28. Brevers D, Cleeremans A, Goudriaan AE, Bechara A, Kornreich C, Verbanck P, Noël X. Decision making under ambiguity but not under risk is related to problem gambling severity. *Psychiatry research*. 2012 Dec 30;200(2-3):568-74.
 29. Mallorquí-Bagué N, Fagundo AB, Jimenez-Murcia S, De La Torre R, Baños RM, Botella C, Casanueva FF, Crujeiras AB, Fernández-García JC, Fernández-Real JM, Frühbeck G. Decision making impairment: a shared vulnerability in obesity, gambling disorder and substance use disorders?. *PLoS One*. 2016 Sep 30;11(9):e0163901.
 30. Verdejo-García A, Alcázar-Córcoles MA, Albein-Urios N. Neuropsychological interventions for decision-making in addiction: a systematic review. *Neuropsychology Review*. 2019 Mar;29(1):79-92.
 31. Al Hakeem M, Chowdhury KU. Executive functions of people with drug addiction. *Dhaka University Journal of Biological Sciences*. 2020 Jan 10;29(1):27-36.
 32. Gupta A, Murthy P, Rao S. Brief screening for cognitive impairment in addictive disorders. *Indian Journal of Psychiatry*. 2018 Feb;60(Suppl 4):S451.
 33. Abbott MW. The changing epidemiology of gambling disorder and gambling-related harm: public health implications. *Public health*. 2020 Jul 1;184:41-5.
 34. Grant JE, Chamberlain SR. Gambling disorder and its relationship with substance use disorders: Implications for nosological revisions and treatment. *The American Journal on Addictions*. 2015 Mar;24(2):126-31.