ASSOCIATION OF LOSS AVERSION, PERSONALITY TRAITS, DEPRESSIVE, ANXIOUS, AND SUICIDAL SYMPTOMS: SYSTEMATIC REVIEW

Cristina Yumi Nogueira Sediyama, Carolina de Castro Martins, Maycoln Leôni Martins Teodoro

Abstract

Objective: Loss aversion is defined as the individual perception of losses with a more significant impact than the gains of the same proportion, where people would be more sensitive to the possibility of losing objects or money than to the possibility of winning, even the same quantities. However, studies relating to loss aversion and psychological factors are still incipient. The aim of the present literature review was to identify and analyze the results of studies that investigated loss aversion regarding personality traits and symptoms of depression, anxiety, and suicidal tendencies.

Method: A systematic review was done through PUBMED and Scopus databases. Descriptors were defined according to each database specificities.

Results: At first, 103 articles were encountered. After evaluation of the inclusion and exclusion criteria, there were a total of 14 remaining articles that were group together into six categories related to loss aversion, depression, anxiety, suicidal tendencies, and personality.

Conclusions: The present study contributes to the literature mapping in the Behavioural Economics field. However, discrepancies were found among the studies, which made it difficult to acquire more conclusive findings.

Key words: psychology, behavioural economics, loss aversion

Cristina Yumi Nogueira Sediyama
Federal University of Minas Gerais (UFMG) Belo Horizonte - MG, Faculty of Philosophy and Human Sciences, Program Psychology Cognition and Behavior
Carolina de Castro Martins
Federal University of Minas Gerais (UFMG) Belo Horizonte - MG, Faculty of Philosophy and Human Sciences, Program Psychology Cognition and Behavior
Maycoln Leôni Martins Teodoro
Federal University of Minas Gerais (UFMG) Belo Horizonte - MG, Faculty of Philosophy and Human Sciences, Program Psychology Cognition and Behavior

Corresponding author
Cristina Yumi Nogueira Sediyama
Av. Pres. Antônio Carlos, 6627
Pampulha, Belo Horizonte
MG, Brazil - 31270-901
E-mail: yumicristina@gmail.com

1. Introduction

Behavioral Economics is a multidisciplinary field that makes use of theories and empirical studies from Psychology, Sociology, Anthropology, and Neuroscience, among other disciplines, to demonstrate the inconsistency between the supposition on the existence of a rational economic man, and the actual economic decision making, in order to understand it with better psychological realism (Loewenstein, Rick & Cohen, 2008; Ogaki & Tanaka, 2018). Furthermore, studies on Behavioral Economics increases the explanatory capacity of theoretical models, enabling insights and better predictions of the phenomena, besides the utility of research findings in and out of the laboratory context (Camerer & Loewenstein, 2004).

Inside Behavioural Economics field, the Prospect Theory, was proposed by Kahneman and Tversky (1979) as a descriptive model of economic behavior, in which one of the fundamental concepts is a phenomenon named loss aversion. In other words, losses are felt with more significant impact than gains of the same proportion, where people would be more sensitive to the possibility

of losing objects or money than they would be of gaining the same objects or amount of money (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). Kahneman (2003) also describes that, according to the loss aversion concept, most people would only choose to accept a 50/50 odds financial bet if the value that they would gain were at least twice as much as what they could lose. According to Tom et al. (2007), this means people would generally demand a potential gain of at least US$ 100 to compensate the exposure to a potential loss of US$ 50.

Inside the study of neurological and psychiatric disorders, poorly adaptive or dysfunctional decision making is common in different types of disorders (Lee, 2013). Recently, in order to clarify the altered decision making in neuropsychiatric disorders, tools from Behavioural Economics' field have been used in clinical psychiatry (Takeuchi, et al., 2016). More specifically, some models of psychiatric disorders aimed to characterize compromised decision making within an economic spectrum, such as studies relating loss aversion to psychiatric disorders (Pammi et al., 2015; Charpentier et al., 2017; Ernst et al., 2014; Sip, Marutore & Stern, 2016; Tremeau et al., 2008).

Reuter and Montag (2016) show that the approaches of economic decision making for mental disorders may not provide theories that explain their etiology. However, through central concepts adopted mainly from economics, could provide a theoretical and methodological scenario, and therefore be of great value to describe the impaired behavior in mental illness patients (Reuter & Montag, 2016). Also, identifying the heterogeneity in loss aversion may be an essential factor for comprehension of cognitive and behavioral mechanisms of risk-taking behavior, as well as contributing for the development of new treatment's strategies (Takeuchi et al., 2016).

Tom et al. (2007) reports that future studies integrating methods from Behavioral Economy and cognitive neuroscience could provide a broader view of the nature of psychopathologies. However, according to Hasler (2012) studies on decision making and economic approaches are incipient, not having until now thoroughly investigated the processes of decision making altered by psychiatric disorders or psychological and pathological factors through experimental behavior tasks.

In the field of psychiatric symptoms and disorders, major depressive disorder (MDD) has a prevalence of 13 to 17% throughout life (Kessler et al., 2005). Beyond the sad mood, difficulty in making decisions is one of the symptoms of MDD (Trivedi & Greer, 2014), and distortions in decision making have been found both in clinical (Leahy, 2001) and experimental (Engelmann, 2013) contexts.

Engelmann, Berns, and Dunlop (2017) show that, from the clinical point of view, the consequences of the dysfunctional behavior of choice can have a high impact in MDD patients. Furthermore, about the typical impacts of impaired decision making in patients with this diagnosis, we can also cite the difficulty in interpersonal relationships (King-Casas & Chiu, 2012). Besides from being frequently associated to pessimism, MDD can also be characterized by changes in decision making, which can be seen in the reduction of sensitivity to rewards, as well as a biased processing of negative information, showing a change in value of probability calculations (Henrique & Davidson, 2000; Pizzagalli et al., 2008; Paulus & Yu, 2012; Beevers, 2013).

Concerning anxiety, it also interferes with the adaptive behavior in daily activities such as in the workplace or social relations (Hartley & Phelps, 2012). Moreover, it is known that anxiety disorders are associated with difficulty in decision making, and as a result, anxious individuals frequently make decisions that favor the avoidance of damage (Charpentier, Aylward, Roiser & Robinson, 2017).

Another essential aspect is the risk of suicide. According to Jollant et al. (2010) patients with history of suicide attempts demonstrated a worse performance in the task of decision making, where the altered processing of risk under conditions of uncertainty was associated with changes in the left lateral orbitofrontal cortex. These changes could explain the deficits in decision making observed in patients that have previously attempted suicide.

Lastly, Ferguson, Heckman and Corr (2011) discuss how the benefits of including the study of personality traits for economics, as a way of psychology offering through this construct a coherent set that, when applied in a theoretically significant manner, can help explain the complexities of patterns in economic behavior. Borghans (2008) also points out that the findings of psychology can also be incorporated into economic analyses, as these are still rationalized by standard economic models. Besides, it would also be essential to identify which personality traits are related to specific results, where such

understanding would not only lead to better measures and models but, also could provide a better orientation for policies and interventions.

Researchers in behavioral economics have also recently started to include measures of personality traits in experiments, in the hopes that it could explain part of the behavioral heterogeneity found in economic tasks, in contrast, many studies relate some personality variables of Big Five Personality Model (Borghans, 2008; Almlund et al., 2011; Müller & Schwieren, 2012; Becker et al., 2012). Therefore, the aim of this systematic literature review was identify and analyze results from loss aversion studies related to personality traits, depressive symptoms, anxiety, and suicide.

2. Method

This review followed five steps, according to the **figure 1**. First PUBMED and Scopus databases were defined for search and identification of articles. The search descriptors were defined according to the specificities of each database. PUBMED database had the following descriptors: (Personality Assessment OR Assessment, Personality OR Assessments, Personality OR Personality Assessments) OR Personality Assessment[MeSH Terms]) OR (Personality Tests OR Personality Test OR Test, Personality OR Tests, Personality) OR Personality Tests[MeSH Terms]) OR Individuality[MeSH Terms]) OR (Individuality OR Individual Differences OR Difference, Individual OR Differences, Individual OR Individual Difference) OR (Suicide OR Suicidal Ideation OR Suicide, Assisted OR Suicide, Attempted) OR Suicide[MeSH Terms]) OR (Anxiety Disorder OR Disorder, Anxiety OR Disorders, Anxiety OR Neuroses, Anxiety OR Anxiety Neuroses OR Anxiety States, Neurotic OR Anxiety State, Neurotic OR Neurotic Anxiety State OR Neurotic Anxiety States OR State, Neurotic Anxiety OR States, Neurotic Anxiety) OR Anxiety Disorders[MeSH Terms]) OR (Anxiety OR Hypervigilance OR Nervousness OR Social Anxiety OR Anxieties, Social OR Anxiety, Social OR Social Anxieties[MeSH Terms]) OR Anxiety[MeSH Terms]) OR (Depressive Disorder OR Depressive Disorders OR Disorder, Depressive OR Disorders, Depressive OR Neurosis, Depressive OR Depressive Neuroses OR Depressive Neurosis OR Neuroses, Depressive OR Depression, Endogenous OR Depressions, Endogenous OR Endogenous Depression OR Endogenous Depressions OR Depressive Syndrome OR Depressive Syndromes OR Syndrome, Depressive OR Syndromes, Depressive OR Depression, Neurotic OR Depressions, Neurotic OR Neurotic Depression OR Neurotic Depressions OR Melancholia OR Melancholias OR Unipolar Depression OR Depression, Unipolar OR Depressions, Unipolar OR Unipolar Depressions) OR Depressive Disorder[MeSH Terms]) OR (Depression OR Depressions OR Depressive Symptoms OR Depressive Symptom OR Symptom, Depressive OR Symptoms, Depressive OR Emotional Depression OR Depression, Emotional OR Depressions, Emotional OR Emotional Depressions) OR Depression[MeSH Terms]) AND loss aversion[Text Word], and Scopus database descriptors were defined as: (TITLE-ABS-KEY ("loss aversion") AND TITLE-ABS-KEY ("Individual Difference*") OR TITLE-ABS-KEY ("Personality Test*") OR TITLE-ABS-KEY ("Personality Assessment*") OR TITLE-ABS-KEY ("Suicid*") OR TITLE-ABS-KEY ("Anxiet*") OR TITLE-ABS-KEY ("Anxiety Disorder*") OR TITLE-ABS-KEY ("Depression") OR TITLE-ABS-KEY ("Depressive Disorder*")).

The procedures reported in this review were performed in January 2019. As inclusion criteria, articles from 2000 to 2019 were selected, being restricted to articles in English only, where the goal was to evaluate the loss aversion through experimental tasks, and its relation to factors of either personality, depression, anxiety, or suicide in the adult population. The exclusion criteria were: articles that addressed only loss aversion, without association to factors of either personality, depression, anxiety or suicide, review articles, theoretical articles, book chapters, articles in languages other than English, and articles with indirect measures of loss aversion. The articles that were repeated between the databases were removed, and afterward, they were read in their entirety to obtain greater detail related to inclusion/exclusion criteria.

3. Results

In the initial phase, 103 articles found, 36 of which were duplicated in the search databases, remaining a total of 67 articles. After this step, all the remaining articles were thoroughly analyzed according to inclusion and exclusion criteria. A total of 52 articles were excluded, among them: a) 35 articles that approached only loss aversion without relating to personality, depression, anxiety or suicide; b) 5 articles that didn't have loss aversion as a theme of study; c) 5 articles of literature review; d) two theoretical articles; e) two articles with indirect measures of loss aversion; f) one book chapter; g) one article in Spanish; h) one article from before the year 2000; i) one article was not found. Finally, a total of 14 articles remained for specific analysis.

We found six categories of articles: loss aversion, depression and anxiety (n=4); loss aversion and anxiety (n=3); loss aversion and personality (n=3); loss aversion and depression (n=2); loss aversion, depression and suicide (n=1) and loss aversion, depression, anxiety and suicide (n=1) (**table 1**).

Concerning the studies relating to loss aversion and depression, the results show that the loss aversion was higher in the group of patients who were diagnosed by major depressive disorder when compared to the control group of healthy patients (Pammi et al., 2015; Engelmann,

Baek, et al. 2017; Berns & Dunlop, 2017). Loss aversion was also positively correlated to the degree of depression in patients with a diagnosis of major depressive disorder (Huh et al., 2016). Furthermore, Timmer et al. (2017), obtained similar results when compared to groups with a diagnosis of Parkinson's disease, with and without a history of depression, where the first group had a higher indication of loss aversion than the second one. However, there were conflicting results in other studies that showed no correlation between loss aversion and depression (Charpentier, Aylward, Roiser & Robinson, 2017; Hadlaczky et al., 2018; Sip, Gonzalez, Taylor & Stern, 2018).

Loss aversion related to symptoms of anxiety did not differ between healthy control groups and the ones that were diagnosed with anxiety disorder (Ernst et al., 2014; Engelmann, Berns & Dunlop, 2017; Hadlaczky et al., 2018; Sip, Gonzalez, Taylor & Stern, 2018), and there was no variation between the trait and the state of anxiety (Charpentier, Hindocha, Roiser & Robinson, 2016; Huh et al., 2016; Charpentier, Aylward, Roiser & Robinson, 2017). Although in the study of Charpentier, De Martino, Sim, Sharot, and Roiser (2016), individuals with a low level of anxiety demonstrated a higher indication of loss aversion.

The results related to loss aversion and personality show that there was no relation between loss aversion and the personality trait of alexithymia (Voigt, Montag, Markett & Reuter, 2015). In Schulreich, Heekeren and Gerhardt (2016), the effect over loss aversion was moderated by the psychopathic personality. Takeuchi et al. (2016) found a difference between the anxiety and sensation seeking subscales in the group of pathological gamblers, but with no difference between the depression subscale.

In the suicide factor, analyzed by Hadlaczky et al. (2018) loss aversion was significantly lower among participants with previous attempts at suicide in comparison to participants with no prior attempts. However, Baek et al. (2017) demonstrated the group of depressed patients with earlier attempts at suicide had higher loss aversion compared to the group of patients with depression that did not previously attempt suicide, and to the control group.

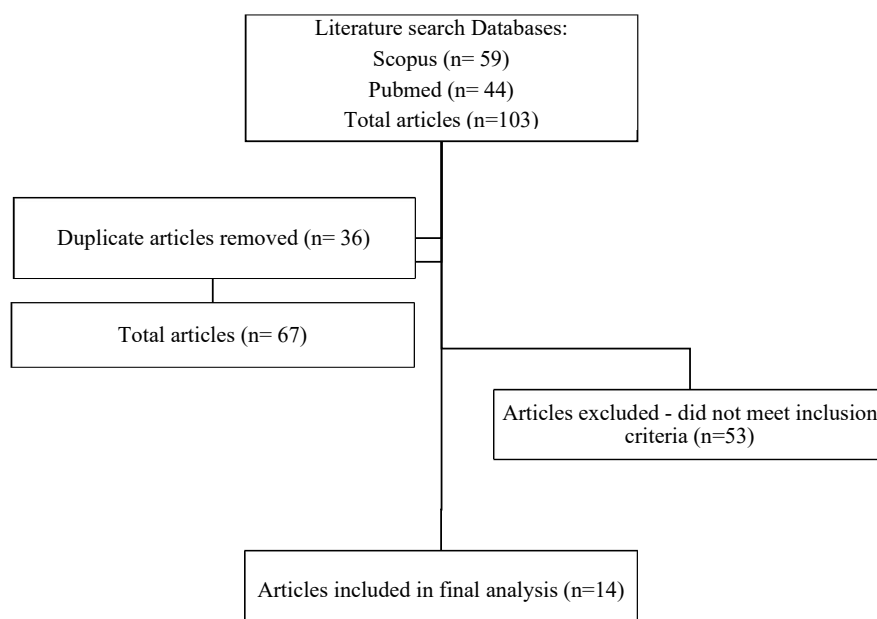**Figure 1.** *Flowchart of review process*

Table 1. *Summary of the articles selected in the review*

Categories	Authors	Country	Population	Age (Mean / S.D.)	Evaluation tools	Results
Loss aversion, depression and anxiety (n=4)	Huh et al. (2016)	Korea	Group Major Depressive Disorder (n=50), with 44% males	Major Depressive Disorder Group: 27.4 (8.7)	Mini-International Neuropsychiatric Interview (MINI) Beck Depression Inventory II (BDI-II) State and Trait Anxiety Inventory (STAI) Childhood Trauma Questionnaire (CTQ) (Bernstein & Fink, 1998) Cognitive Emotion Regulation Questionnaire (CERQ) Probabilistic Discounting Task Economic decision-making task – loss aversion	The degree of depression was positively correlated with loss aversion. The anxiety trait was not associated with loss aversion.
	Charpentier, Aylward, Roiser & Robinson (2017)	England	Generalized Anxiety Disorder - non medicated (n= 25), 20 females Healthy Control Group (n=23), 18 females	Generalized Anxiety Disorder -non medicated: 25.2 (4.9) Healthy Control Group: 25.7 (6.5)	State-Trait Anxiety Inventory Beck Depression Inventory Mini-International Neuropsychiatric Interview Wechsler Test of Adult Reading Emotional Memory Task Gambling Task	Generalized anxiety disorder group and healthy group exhibited similar levels of loss aversion. There was no correlation between loss aversion in depression and anxiety trait.
	Engelmann, Berns & Dunlop (2017)	United States	Major Depressive Disorder Group (n=21), 9 males Healthy Control Group (n=25), 9 males	Major Depressive Disorder Group: 33.7 (11.6) Healthy Control Group: 37.6 (11.0)	Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (SCID) Hamilton Depression Rating Scale HAMD Hamilton Anxiety Rating Scale (HAMA) Wechsler Abbreviated Scale of Intelligence (WASI) Economic decision-making task adapted from Tom et al. (2007)	Patients with unmedicated depression demonstrated higher loss aversion when compared to the healthy control group. Anxiety does not interact with loss aversion.
	Sip, Gonzalez, Taylor & Stern (2018)	United States	Obsessive-compulsive disorder group, without medication (n=14), 3 males Obsessive-compulsive disorder group, without medication, 15 males Healthy Control Group (n=34), 14 males	Obsessive-compulsive disorder group, without medication: 26.0 (7.2) Obsessive-compulsive disorder group, with medication: 26.0 (5.5) Healthy Control Group: 26.7 (7.9)	Mini-International Neuropsychiatric Interview Structured Clinical Interview for DSM diagnoses Yale-Brown Obsessive–Compulsive Scale (Y-BOCS) Spielberger State-Trait Anxiety Inventory (STAI) Beck Depression Inventory (BDI) Hamilton Depression Rating Scale (HDRS) Economic decision-making task adapted from Tom et al. (2007)	Obsessive-compulsive disorder group with and without medication showed no correlation about loss aversion and symptoms of anxiety and depression.

Table 1. *Continued*

Loss aversion and anxiety (n=3)	Ernst et al. (2014)	United States	Anxiety Disorder Group (n=27), 12 males Healthy Control Group (n=39), 19 males	Anxiety Disorder Group: 11.5 (2.5) Healthy Control Group: 13.1 (2.5)	Semi-structured Diagnostic Interview (K-SADS) Wechsler Abbreviated Scale of Intelligence (WASI) Screen for Child Anxiety Related Emotional Disorders (SCARED) Economic decision-making task adapted from Tom et al. (2007)	Loss aversion did not differ between anxiety group and healthy control group.
	Charpentier, De Martino, Sim, Sharot & Roiser (2016)	England	Healthy Control Group (n=28), 15 males	Healthy Control Group: 26.5 (no information)	Mini International Neuropsychiatric Interview Beck Depression Inventory State-trait Anxiety Inventory Emotional Decision-making Task – loss aversion	Individuals with low levels of anxiety exhibited higher loss aversion. The association between loss aversion and depression was not evaluated in this study.
	Charpentier, Hindocha, Roiser & Robinson (2016)	England	Healthy Control Group (n=55), 24 males	Healthy Control Group: 24.1 (5.5)	Emotional working memory and decision-making task Beck Depression Inventory II (BDI-II) State Trait Anxiety Inventory (STAI) Short State Anxiety Inventory (SSAI)	Loss aversion does not vary with anxiety trait or state. The association between loss aversion and depression was not evaluated in this study.
Loss aversion and personality (n=3)	Voigt, Montag, Markett & Reuter (2015)	Germany	• Group (n=143), 29 males	Group: 21.8 (4.0)	Toronto Alexithymia Scale (TAS-20) Economic decision-making task adapted from Tom et al. (2007)	There was no correlation between the personality trait of alexithymia and loss aversion.
	Schulreich, Heekeren & Gerhardt (2016)	Germany	**STUDY 1:** Healthy Participants Group (n=29), 20 females **STUDY 2:** Healthy Participants Group (n=24), 13 females	**STUDY 1** Group Healthy Participants: 26.7 (5.2) **STUDY 2** Group Healthy Participants: 24.2 (5.3)	Decision-making task and affective priming – task adapted based in De Martino et al., 2010 German version of the Psychopathic Personality Inventory—Revised (PPI-R) Psychopathic Personality Inventory—Revised (PPI-R)	Loss aversion was moderated by the psychopathic personality.
	Takeuchi et al. (2016)	Japan	Pathological Gamblers Group (n=31), all males Healthy Control Group (n=26), all males	Pathological Gamblers Group: 33.4 (7.5) Healthy Control Group: 34.8 (6.3)	Structured Clinical Interview for Pathological Gambling (SCI-PG) Structure Clinical Interview for DSM-IV-TR Fargerstrom Test for Nicotine Dependence (FTND) Oaks Gambling Screen (SOGS) Gambling Craving Scale (GACS) Japanese Adult Reading Test (JART) short form Revised NEO Personality Inventory (NEO-PI-R) - score of the five factors and four subscales: anxiety, depression, impulsiveness, and excitement-seeking Risky Choice Task - used in a previous study (Takahashi et al. 2013)	Pathological Gamblers Group participants with low and high loss aversion showed a significant difference in anxiety and excitement-seeking subscales. There was no difference regarding depression subscale.

Table 1. *Continued*

Loss aversion and depression (n=2)				
Pammi et al. (2015)	India	Major Depressive Disorder Group (n=10), with 2 females Healthy Control Group (n=10), with 4 females	Major Depressive Disorder Group: 31.9 (7.5) Healthy Control Group: 27.5 (2.4)	Edinburgh Handedness Inventory Hospital Anxiety and Depression Scale (HADS) Mini International Neuropsychiatric Interview (MINI) Economic decision-making task adapted from Tom et al. (2007)	Loss aversion was higher in patients diagnosed with major depressive disorder when compared to the healthy control group. The association between loss aversion and anxiety was not evaluated in this study.
Timmer et al. (2017)	Netherlands	• Group of patients with Parkinson's and depression (n=21), 13 males • Group of patients with Parkinson's and no depression (n=22), 13 males • Healthy Control Group (n=23), 14 males	Group of patients with Parkinson's and depression: 58.5 (5.8) Group of patients with Parkinson's and no depression: 61.0 (7.6) Healthy Control Group: 60.9 (5.9)	Dutch version of the National Adult Reading Test (NART) Unified Parkinson's Disease Rating Scale, Part III (UPDRS–III) Mini-International Neuropsychiatric Interview (MINI-plus) Mini Mental State Examination (MMSE) Beck Depression Inventory (BDI) Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease-Rating Scale (QUIP-RS) Economic decision-making task adapted from Tom et al. (2007)	Patients with Parkinson's disease and history of depression have higher loss aversion than patients with Parkinson's and no history of depression.
Loss aversion, depression and suicide (n=1)				
Baek et al. (2017)	Korea	Depressed patients with previous attempts at suicide Group (n=45), 24 males Depressed patients without previous attempts at suicide Group (n=47), 22 males Healthy Control Group (n=75), 46 males	Depressed patients with previous attempts at suicide Group: 24.5 (5.9) Depressed patients without previous attempts at suicide Group: 26.8 (6.3) Healthy Control Group: 25.4 (4.6)	Mini-International Neuropsychiatric Interview (M.I.N.I.) Beck Depression Inventory Beck Hopelessness Scale Beck Scale for Suicide Ideation State and Trait Anxiety Inventory Barratt Impulsiveness Scale Behavioral Inhibition and Activation Scales (BIS/BAS) Emotional Regulation Questionnaire (ERQ) Risk aversion task Loss aversion task	Depressed patients had higher loss aversion in relation with the healthy control group. The group of depressed patients with previous suicide attempts had higher loss aversion than the group without previous attempts, as well when compared to control group. The association between loss aversion and anxiety was not evaluated in this study.
Loss aversion, depression, anxiety and suicide (n=1)				
Hadlaczky et al. (2018)	Hungary, Italy, Lithuania, Spain, Sweden, United Kingdom, Estonia.	• Healthy Participants Group (n=2.286), 56% of females	Healthy Participants Group: 15.8 (0.9)	Depression, Anxiety, and Stress Scale (DASS-42) Paykel's suicide scale Loss Aversion Questionnaire	No association was found between loss aversion, depression and anxiety. Loss aversion was significantly lower among attempters when compared to non-attempters.

4. Discussion

The aim of this literature review was to identify and analyze the results of articles related to loss aversion concerning symptoms of depression, anxiety, suicide, and personality traits. As a result, 14 original articles were found.

Through the findings, depression was correlated to a higher loss aversion, both when comparing clinical groups with healthy control groups, and also when comparing it between groups of patients with depression (Pammi et al., 2015; Huh et al., 2016; Timmer et al. 2017; Engelmann, Berns & Dunlop, 2017; Baek et al., 2017). However, other studies demonstrated controversial results, where loss aversion was not significantly correlated with depressive symptoms (Charpentier, Aylward, Roiser & Robinson, 2017; Hadlaczky et al., 2018; Sip et al. 2018). This divergence can be explained by the fact that correlations between depression and loss aversion were found in samples composed of groups with major depressive disorder, while studies that did not find this correlation were based on other clinical samples such as generalized anxiety disorder (Charpentier, Aylward, Roiser & Robinson, 2017) obsessive-compulsive disorder (Sip, Gonzalez, Taylor & Stern, 2018), and healthy group (Hadlaczky et al., 2018).

Concerning loss aversion and anxiety traits and state of anxiety, most studies found no correlation between these factors (Ernst et al., 2014; Charpentier, Hindocha, Roiser & Robinson, 2016; Huh et al., 2016; Charpentier, Aylward, Roiser & Robinson, 2017; Engelmann, Berns & Dunlop, 2017; Hadlaczky et al., 2018; Sip, Gonzalez, Taylor & Stern, 2018). Nevertheless, in Charpentier, De Martino, Sim, Sharot, and Roiser (2016) study, the authors developed an emotional decision-making task for assessing emotional influences on loss aversion in which gambling decisions were preceded by emotional and non-emotional primes. The results indicated that individuals with low levels of anxiety have demonstrated higher loss aversion induced when primed with emotional cues. Both positive and negative emotional stimuli have a similar effect, and there were no differences in photos of facial neutral expression on loss aversion. Loss aversion was associated with increased signals in the striatum and amygdala, regions that have been implicated in previous studies (i.e., Tom et al., 2007). The authors suggest that emotional signals would modulate loss aversion in individuals with low anxiety due to their greater behavioral flexibility and reflect an adaptive ability to deploy harm-avoidance strategies. In contrast, they suggest that individuals with high anxiety due to emotional hypersensitivity.

Concerning loss aversion and suicide, we also found conflicting results. In the study of Baek et al. (2017), the higher loss aversion was related to suicide attempts, although in the study of Hadlaczky et al. (2018), loss aversion was significantly lower among participants with previous attempts at suicide in comparison to patients without previous attempts. Baek et al. (2017) discuss these results with the argument that the increasing sensitivity to loss in the suicide attempt group and possible additional interaction, that patients who attempted suicide may overestimate the odds in the context of loss and can estimate possible negative events in the future for much more negatively valued. Their hypothesis is that suicide may be the most extreme option of avoiding what is expected to be a more aversive future.

Moreover, some methodological differences between studies may have influenced the results. For example, in Baek et al. (2017) the study population consisted of a clinical population diagnosed with major depressive disorder. As in the previous results, this population tends to have a positive association with loss aversion. While in the study of Hadlaczky et al. (2018), the population was composed of a group of healthy people, and the measures of loss aversion were different between studies, the first being performed by a computerized task and the second by a questionnaire.

The findings related to loss aversion and personality demonstrated that the aversion was moderated by the psychopathic personality (Schulreich, Heekeren & Gerhardt 2016), and in a group of pathological gamblers found a difference between the anxiety and sensation seeking subscales (Takeuchi et al., 2016). The results showed there was no relation found between loss aversion and the personality trait of alexithymia (Voigt, Montag, Markett & Reuter, 2015).

These findings concerning personality shows that, despite the importance of behavioral economics studies, there is still a lack of studies, specifically on the relation between loss aversion and personality. Therefore, Borghans (2008) raises some hypotheses for this deficiency in the field of behavioral economics and personality, that includes the lack of familiarity of the economists with these personality measures. Besides that, the author suggest that many economists would rather believe that this behavior is entirely circumstantially determined, that there is still little incentive to include sufficiently broad personality measurements with nuances in empirical studies. Becker et al., (2012) reaffirm this in the way they show how the empirical knowledge of this subject is still too limited to determine how personality traits relate to the concepts and parameters that economists typically use to model and predict behavior. Thereby, according to Appelt et al. (2011) given the heterogeneity of behavior, individual differences have been underestimated, but represent an unexplored frontier that can deepen our understanding of the processes of decision making.

The present study contributes to the literature review of the field related to behavioral economics, precisely the phenomenon of loss aversion and neuropsychiatric symptoms, as well as personality traits. However, the reduced number of articles found as well as the divergences concerning the results, made it difficult to obtain conclusive findings. Duke et al. (2018), suggest that these divergences of results could be due to the variation of the methodology in the studies of loss aversion.

Furthermore, the exclusion of studies that address corresponding constructs of loss aversion can also bias our understanding of decision making processes. The delay discounting, for instance, is one element which underlies decision-making (da Mata, Gonçalves & Bizarro, 2012) that refers to the observation that the value of a delayed reinforcer is discounted (reduced in value or considered to be worthless) compared to the value of an immediate reinforcer. (Bickel & Marsch, 2001; Bickel et al. 2019).

According to Leung (2017) in loss aversion, there is the threat of losing something, and it can be viewed as negative reinforcement. This phenomenon is characterized by an increase in behavior that escapes or removes an aversive stimulus (Pierce and Cheney, 2017). Whereas the concept of loss aversion is associated with the avoidance of loss as a future aversive stimulus, the delay discounting refers to the loss of the value of the reward in time. High delay discounting rates has been associated with smoking cigarettes (Odum et al, 2002; Reynolds, Richards, Horn and Karraker, 2004)

and pathological gambling (Dixon, Marley and Jacobs, 2003), when compared to control groups. Moreover, there are evidences that delay discounting may be considered as a personality trait, once is a stable and pervasive individual characteristic, and prove to be a beneficial therapeutic target (Odum, 2011).

Although the constructs of delay discounting and loss aversion can be conceptually overlapped, they have different theoretical backgrounds. In this article, the focus on the construct of loss aversion is rooted in the cognitive psychology approach. This delimitation doesn't address the complexibility of the decision making processes but allowed us to focus on the relationship of the specific aspect of decision making that involves loss aversion and other constructs.

Therefore, future research may increase the explanatory power of the relation between loss aversion and neuropsychiatry and, contribute to add further knowledge about this phenomenon. Finally, in clinical terms, the understanding of the impaired decision making of clinical patients could contribute to identify possible targets for cognitive-behavioral therapies clinically (Charpentier, Aylward, Roiser, and Robinson, 2017).

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