Impulsivity in an epidemiological catchment area sample of the general population: A confirmatory factor analysis study of the Barratt Impulsiveness Scale

Kerry Weinstein, B.A. Department of Psychiatry McGill University, Montreal, Quebec August 2012

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ABSTRACT

Impulsivity is a complex behavioural and personality construct that is correlated to aggression (Fossati et al., 2004) and major mental disorders (Enticott, Ogloff, Bradshaw, & Fitzgerald, 2008). The Barratt Impulsiveness Scale (BIS; Barratt, 1959) is arguably the most commonly administered self-report measure of impulsiveness in both research and clinical settings (Spinella, 2007). However, the extant literature reveals a confusion surrounding the BIS, in particular version 11a (Barratt, 1994). Stanford et al. (2009) warn against its use due to its invalidity and unreliability. However, to our knowledge, no study published has attempted to examine the structure of the BIS-11a. Nonetheless, many studies have used it and erroneously report its item content, factor structure, and/or appropriate referencing. Thus, the current study aimed to validate the construct and internal validity of both the English and French BIS-11a based on Barratt's (1994) original factor structure. Analyses were based on data from the psychiatric epidemiological catchment area (ECA) study in southwest Montreal (Caron et al., 2007). Randomly selected participants, ages 15 - 65, completed either the English (n = 703) or French (n = 1,450) BIS-11a as well as a sociodemographic questionnaire. Internal consistency reliability estimates of the BIS-11a were satisfactory across language groups, although the 'coping stability' subscale was weaker than expected. Separate confirmatory factor analyses showed that the Barratt (1994) factor structure fit both of the language versions almost identically well. However, uniformly high interfactor correlations suggest that a higher order factor structure might provide the optimal model for the BIS-11a items. Importantly, this marks the first research to explore the psychometric properties of the BIS-11a since the original Barratt (1994) study. Moreover, seeing as Barratt's original samples were college students and psychiatric patients, ours is also the first study to examine the BIS-11a with a representative sample of the general population.

ABRÉGÉ

L'impulsivité est un trait de personnalité corrélé aux troubles mentaux (Enticott, Ogloff, Bradshaw, & Fitzgerald, 2008) et aux comportements agressifs (Fossati et al., 2004). L'échelle d'impulsivité de Barratt (BIS; Barratt, 1959) est la mesure d'auto-évaluation d'impulsivité la plus utilisée en recherche et dans la pratique clinique (Spinella, 2007). Cependant, la documentation scientifique existante révèle une confusion concernant la structure factorielle de cet instrument, particulièrement pour la version 11a (Barratt, 1994). Stanford et al. (2009) ne recommandent pas l'utilisation de la BIS-11a parce qu'elle n'est pas considérée comme valide et fiable. Toutefois, à notre connaissance, il n'existe aucune étude ayant répliqué la structure de la BIS-11a. Néanmoins, beaucoup d'auteurs utilisent cette version de l'échelle et rapportent son contenu, sa structure factorielle, et/ou ses origines de façon erronée. Ainsi, la présente étude cherche à établir sa validité interne et conceptuelle (pour la version anglaise et la version française) basée sur la structure factorielle originale de Barratt (1994). Les analyses sont basées sur les données de l'enquête épidémiologique psychiatrique dans le sud-ouest de Montréal (Caron et al., 2007). L'échantillon représentatif est constitué de participants choisis aléatoirement, âgés entre 15 et 65 ans. Les participants de cette étude ont complété soit la version anglaise (n = 703) ou la version française (n = 1,450) de la BIS-11a ainsi qu'un questionnaire sur des informations sociodémographiques. Les statistiques de fiabilité interne pour la BIS-11a étaient satisfaisantes pour les deux versions, mais le facteur de « stabilité d'adaptation » était plus faible qu'attendu. Les analyses factorielles confirmatoires ont démontré que la structure factorielle de Barratt (1994) était bien ajustée aux données pour les deux versions. Cependant, les intercorrélations uniformes élevées suggèrent qu'une structure factorielle d'un ordre supérieur aurait peut-être produit un modèle plus optimal. Cette étude est la première à examiner les propriétés psychométriques de la BIS-11a. De plus, tandis que les participants des études de Barratt (1994) étaient des étudiants et des patients psychiatriques, notre étude est la première à examiner la BIS-11a avec un échantillon qui est représentatif de la population générale.

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INTRODUCTION

Impulsivity is a complex personality and behavioural construct (Barratt & Patton, 1983). Despite the widespread attention it has received in the scientific literature since the 1940s, there remains to this day little agreement over how this multifaceted concept should be defined. This lack of consensus is also evident in the measurement of impulsivity. While the Barratt Impulsiveness Scale (BIS; Barratt, 1959) remains arguably the most common means of measuring impulsivity, a review of the extant literature reveals a resounding confusion as to the appropriate factor structures that correspond to the various versions of the scale – in particular, version 11a.

1.1 Definition of impulsivity

The term 'impulsivity' or impulsiveness has previously been used to denote loosely defined constructs. For instance, a personality trait or cognitive style characterized by disinhibition, or a tendency to act quickly on urges or to stimuli (Brodsky, Oquendo, Ellis, Haas, Malone, & Mann, 2001). As Depue and Collins (1999) wrote, "impulsivity comprises a heterogeneous cluster of lowerorder traits such as sensation seeking, risk-taking, novelty seeking, boldness, adventuresomeness, boredom susceptibility, unreliability, and unorderliness" (p. 495). Evidently, the construct of impulsivity is multifaceted, encompassing aspects such as inhibitory control, response to punishment, response to novelty, and delay discounting aversion (Nigg, 2000).

In its earlier conceptualizations, impulsivity was defined as swift action executed without forethought or conscious judgment (Hinslie & Shatzky, 1940). By the late twentieth century, Dickman (1993) elaborated on this by proposing

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that impulsivity is the tendency to act with less forethought than would most individuals of equal knowledge and ability. Patton, Stanford and Barratt (1995) went a step further by separating impulsivity into three components: 1) acting on the spur of the moment (motor activation), 2) not focusing on the task at hand (attention), and 3) not planning and thinking carefully (lack of planning). Some researchers have proposed that impulsiveness and compulsiveness lie at opposite ends of the same spectrum (Stein, Hollander, Simeon, & Cohen, 1994).

One of the most commonly used definitions of impulsivity comes from Moeller, Barratt, Dougherty, Schmitz, and Swann (2001). According to this group, impulsivity constitutes "a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to either the impulsive individual or to others" (p. 1784). Three features of this conceptualization merit attention. First, impulsivity is defined as a predisposition - that is, part of a pattern of behaviour - rather than a single act. Secondly, it is defined as rapid, unplanned action that occurs before the opportunity to consciously weigh the consequences of an act. This feature distinguishes impulsivity from impaired judgment or compulsive behaviours, in which planning does indeed occur before the act. This distinction has been evidenced in studies demonstrating that individuals who exhibit premeditated aggression (arguably poor judgment) show different patterns of brain activity (Barratt, Stanford, Kent, & Felthous (1997), as well as different responses to medication (Barratt, Stanford, Felthous, Kent, 1997), than those who display impulsive aggression. Finally, this definition highlights that impulsivity implies action without regard to its consequences, and thus involves risks. However,

Moeller et al. (2001) argue that these risks are different in origin from the risks often related to sensation seeking.

According to Block (1995), impulsivity suffers from both the "jingle" and "jangle" fallacies. The former refers to cases in which two constructs with equivalent labels are in reality quite different. For instance, impulsivity measures may reflect constructs as diverse as a short attention span and a tendency to participate in risky behaviour. The latter refers to situations in which two constructs with different labels are actually the same. For instance, Tellegan and Waller's (1994) 'control' and Zuckerman's (1994) 'disinhibition' scales seem to measure similar constructs, yet they bear different labels. Both the jingle and jangle fallacies considerably inhibit our understanding of impulsivity.

Despite difficulties in defining impulsivity, impulsivity plays an unambiguously prominent role in understanding and diagnosing various forms of psychopathology. In fact, after subjective distress, it represents the most common diagnostic criteria in the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV; American Psychiatric Association, 2000). For years there has been a considerable amount of research exploring how this construct relates to a range of externalizing problems, including substance misuse (e.g., Dom, D'haene, Hulstijn, & Sabbe, 2006), personality disorders (e.g., Fossati et al., 2004), aggression (e.g., Fossati et al., 2004), self-injurious behaviour (e.g., Raust et al., 2007), severe mental illness (e.g., Enticott, Ogloff, Bradshaw, & Fitzgerald, 2008), and psychopathy (e.g., Jackson, Neumann, & Vitacco, 2007). It is clear that impulsivity is relevant to explaining both normal individual differences in personality and more extreme personality pathology among clinical populations.

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For this reason, researchers from a number of domains are still actively trying to elucidate impulsivity's exact nature.

1.2 Impulsivity as a psychological construct

Within psychological literature, researchers using a cognitive approach to operationalize impulsivity have argued that the tendency to respond quickly without thinking is attributable to biologically based differences in "cognitive tempo" (Barratt & Patton, 1983). In a similar vein, White, Moffitt, Caspi, Bartusch, Needles, & Stouthamer-Loeber (1994) suggested that the expression of impulsivity might be linked to individual differences in the perception and understanding of time. Wilson and Herrstein (1985) theorized that a "present orientation", characterized by a rapid cognitive tempo and shortened "time horizons", underlies impulsive, disinhibited behaviour. They went a step further by postulating that this cognitive style increases the likelihood that an individual will engage in antisocial activities that yield rewards in the short run but are associated with punishment in the long run. Indeed, a number of studies have shown that subjects with a history of antisocial behaviour have difficulty on tasks designed to assess their time estimation and production abilities (e.g. Barndt & Johnson, 1955; Barratt & Patton, 1983; Getsinger, 1976). Ultimately, the cognitive approach to operationalizing impulsivity suggests that this construct can be measured at the cognitive level by assessing mental control and cognitive tempo.

Researchers in behavioural psychology, on the other hand, have conceptualized impulsivity as a form of behavioural disinhibition that results in a lack of behavioural control. Gray, Owen, Davis, and Tsaltas (1983) proposed two biologically based behavioural systems that are responsible for these mechanisms. The first - the behavioural inhibition system (BIS) - operates to inhibit behaviour, and thereby causes us to reflect in the face of cues for punishment, novelty, or frustrative nonreward. The second – the behavioural activation system (BAS) operates to activate behaviour in the face of cues for reward and escape from punishment. According to Gray et al. (1983), impulsive individuals are characterized by an imbalance between the functioning of the BIS and the BAS. That is, they ignore punishment cues and fail to modify their active response set in the presence of reward. A dominant BAS is a stable characteristic, and it results in an impulsive personality style characterized by poor behavioural self-control, especially in situations where both reward and punishment cues are present. This approach suggests that instruments that assess a disinhibited behavioural response style can tap impulsivity.

Personality researchers postulate that impulsivity is an enduring dimension of behaviour that is manifest in distractibility, high levels of behavioural activity, inability to delay gratification, short-lived interpersonal relationships, and antisocial behaviour (Block & Block, 1980; Schalling, Asberg, Edman, & Oreland, 1987). Impulsivity is regarded as a personality trait and thus, like all other personality traits, is considered an enduring style of relating to the world that is attributable to the interaction between heritable individual differences and environmental circumstances (Buss & Plomin, 1975). Research has indeed shown that impulsivity appears to be relatively stable across the life span (Klintberg, Magnusson, & Schalling, 1989). For these reasons, instruments originating from a personality approach are aimed at tapping the *enduring* tendency to act without thinking, to be impatient, and to channel impulses into action.

1.3 Measurement of impulsivity

As mentioned earlier, the construct of impulsivity is relevant to explaining both normal individual differences in personality as well as more extreme personality pathology among clinical populations. For this reason, the accurate assessment of impulsiveness has been of wide interest in scientific literature. Although a variety of measures have been found to correlate with impulsivity and have therefore been used as "measures" of it, Moeller et al. (2001) distinguish between three main classes of instruments that appear to measure key aspects of impulsivity: behavioural laboratory measures, event-related potentials, and selfreport. It should be noted, however, that there has been little agreement - of either a correlational or a conceptual nature - among different measures of impulsivity (Barratt & Patton, 1983; Gerbing, Ahadi, & Patton, 1987; Paulsen & Johnson, 1980; Pulkinnen, 1986).

Behavioural laboratory instruments. Researchers (e.g. Cherek, Moeller, Dougherty, & Rhoades, 1997; Dougherty, Bjork, Huckabee, Moeller, Swann, 1999) have used laboratory-based measures to come up with several behavioral models of impulsivity. These measures can be separated into three broad categories of lab paradigms: 1) punished and/or extinction paradigms, in which impulsivity is defined as the perseverance of a response that is punished or unrewarded (Matthys, van Goozen, de Vries, Cohen-Kettenis, van Engeland, 1998); 2) reward-choice paradigms, in which impulsivity is indicated by the preference for a small immediate reward over a larger delayed reward (Ainslie,

1975); and 3) response disinhibition/attentional paradigms, in which impulsivity is defined either as making premature responses or as the inability to withhold a response (Halperin, Wolf, Greenblatt, Young, 1991). These behavioural measures are advantageous because they are suitable for repeated use, and consequently suitable for treatment studies as well. In addition, they have the potential to be used with laboratory animals, thus allowing for comparative studies of the basic biochemistry of impulsive behaviours. Their drawbacks, however, are that they do not incorporate the social aspects of impulsivity and they cannot measure the long-term patterns of behaviour.

Event-related potentials. Event-related potentials make up the second class of methods used to measure impulsivity. This type of measurement refers to the recording of a participant's electrical brain activity while he or she performs various tasks that are believed to tap into impulsive behaviour. Specific waveforms are targeted, and thus constitute potential measures of biological predispositions to impulsiveness. Event-related potentials are beneficial because they are directly related to brain function and are therefore completely objective. Although they are not unique markers of impulsivity, when combined with other measures they are certainly valuable predictors of it.

Self-report. Self-report measures, such as the Eysenck Impulsiveness Questionnaire (Eysenck, Pearson, Easting, & Allsopp, 1985), the Barratt Impulsiveness Scale, 11th version (BIS-11; Patton, Stanford, & Barratt, 1995), and the more recent UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001) represent the third and final category of commonly used instruments. These kinds of measures are often used in order to gather information on a variety of types of

acts and on whether or not these acts constitute long-term patterns of behaviour. Due to the multiple responses biases (e.g., social desirability) that can distort selfreported responses, some researchers prefer to use more objective measures, such as laboratory behavioural assessments (e.g., the go-stop task). However, advantages of self-report measures are namely their brevity and ease of administration, as well as their ability to tap into behaviours that feature sociocontextual aspects.

1.4 The Barratt Impulsiveness Scale (BIS)

The Barratt Impulsiveness Scale (BIS; Barratt, 1959) is arguably the most commonly administered self-report measure of impulsiveness in both research and clinical settings (Spinella, 2007). With its widespread application over the last 50 years, the instrument has significantly shaped the way that impulsivity is conceptualized across psychology and psychiatry.

Dr. Ernest S. Barratt originally developed the BIS in 1959. At the time of its creation, research on impulsivity was starting to noticeably shift from intrapsychic deficit models (or lack of "ego control") to an emphasis on observable behaviours (Oas, 1985). The scale was created as part of Barratt's attempt to relate impulsiveness and anxiety (which he believed were orthogonal) to psychomotor efficiency (Barratt, 1959). The original BIS was actually constructed to measure impulsivity as a unidimensional personality trait, but was later amended to incorporate six then three dimensions, the first multidimensional measure of impulsivity (Barratt, 1972, 1985; Barratt & Stanford, 1995).

The primary strength of the BIS is that, as opposed to behavioural or neurobiological measures of impulsivity, the scale assesses multiple aspects of

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impulsivity (i.e. motor, non-planning, cognitive) and thereby taps into its multidimensional nature.

Researchers have been examining the scale ever since its inception in 1959, and several modifications have occurred by Barratt and his colleagues in their continual attempt to improve the instrument's validity and to clarify the construct of impulsiveness. The most recent version, the BIS-11 (Patton, Stanford, & Barratt, 1995), has demonstrated the strongest psychometric properties thus far. However, studies still often use the BIS-10 and BIS-11a versions.

BIS-10. The 10th version of the BIS (BIS-10; Barratt, 1985) is a 34-item self-report questionnaire designed to measure impulsiveness (see Appendix B for a full list of items). All items are answered on a 4-point scale (1 = Rarely/Never, 2 = Occasionally, 3 = Often, 4 = Almost Always/Always). The scale came about as a result of a long series of analyses performed by Barratt (Barratt, 1965, 1972; Barratt & Patton, 1983) that were aimed at developing an item pool that more specifically measured 'impulsiveness' in contrast to other "action-oriented" traits, such as sensation seeking, extraversion, and risk taking. Barratt concluded that three dimensions constituted impulsiveness: cognitive (making quick decisions), motor (acting without thinking), and nonplanning impulsiveness (a lack of 'futuring' or forethought). Thus, the BIS-10 was redesigned, a priori, to measure these three theoretical subtraits. This three-tiered structure of impulsiveness has been subsequently demonstrated in the literature (Gerbing et al., 1987; Miller, Joseph, & Tudway, 2004; Parker, Bagby, & Webster, 1993; Patton et al., 1995).

Importantly, Baylé et al. (2000) replicated this factor structure using their French translation of the BIS-10 (translated into French via back-translation¹). Based on a general population sample of 280 men (n = 119) and women (n = 161), ages 18 - 79, the authors performed a principal component analysis of the BIS-10 using oblique rotation. This analysis yielded three second-order factors consistent with those initially proposed by Barratt (1985): cognitive, motor, and nonplanning impulsiveness. Despite their small sample size, this study is crucial to ours, as it was the only one to date to translate any version of the BIS into French.

*BIS-11a*². As Barratt and his research team continued to use the BIS-10 after its development, the results of their original analysis did not hold up, especially the alpha coefficients for the 'cognitive impulsiveness' subfactor. Luengo, Carrillo-de-la-Pena, and Otero (1991) also found that the BIS-10 cognitive subscale did not emerge as a factor, and suggested that it be redefined. However, from a clinical viewpoint, Barratt was still convinced that there was a cognitive impulsiveness factor, and that it was difficult to measure with self-report simply due to the inferential nature of cognition. The extent to which individuals can assess their own cognitive functions remains controversial, especially if they are impulsive. Nonetheless, Barratt proceeded to revise the BIS-10 and develop a new version, with an emphasis on cognitive items. The revised

¹ The authors reported that the French translation of the BIS-10 did not pose any significant problems. Their aim was to carry out a translation that was the most literal as possible, and the result was that more than 70% of items landed up, after being translated, in a form that was almost identical to the original English version. The remaining items were modified based on the observed differences between the original English version and the translated French version.

² Not to be confused with the Barratt Impulsiveness Scale-Adolescent version (BIS-11-A; Fossati, Barratt, Acquarini, & Di Ceglie, 2002), a 30-item self-report questionnaire developed for use with adolescents that is an adaptation of the adult BIS-11 (Patton et al., 1995).

version dropped five items from the BIS-10: "I make up my mind quickly", "I don't pay attention", "I can only think about one problem at a time", "I change hobbies", and "I like puzzles". He also added a new, unique item ("I finish what I start"), bringing the scale to a total of 30 items. Upon close examination of Barratt's (1994) study, there is no concrete justification or rationalization for the removal of these items, nor for the addition of the new one. Evidently, this is a limitation of the study, particularly in light of the fact that his goal was to reshape the BIS-10 with an emphasis on cognitive items, yet the first three out of the five he removed seem strongly cognitive in nature.

After administering this new version to samples of college students (N = 151) and psychiatric inpatients (N = 92), Barratt's (1994) exploratory analysis found that the three subtraits of impulsiveness were: ideo-motor, careful planning (attention to details), and coping stability (future-oriented). Barratt (1994) called this updated version the 'BIS-11'. However, just a year later, Patton, Stanford and Barratt (1995) published another version of the BIS-11, which went on to receive enormous attention from researchers all around the world. Consequently, Barratt's significantly lesser known version from 1994 became retrospectively known as an early, intermediate version of Patton et al.'s (1995) BIS-11 and, as such, was referred to as the BIS-11a (see Appendix C).

BIS-11. In 1995, Patton et al.'s (1995) attempt at revising the BIS-10 was published. They administered the BIS-10 to a sample of 412 university undergraduates, 248 psychiatric inpatients, and 73 male prison inmates. In their procedure, items that did not have significant corrected item-total correlations nor differentiate extreme groups were excluded from further analyses. These criteria

resulted in the removal of four items from the BIS-10: "I have regular health check-ups", "I walk and move fast", "I solve problems by trial and error", and "I talk fast". These items are all different from those that were previously dropped in the development of the BIS-11a by Barratt (1994). The remaining items were submitted to an exploratory principle components analysis (PCA). Ultimately, the 30 items loaded on six first-order factors: 1) attention (focusing on the task at hand), 2) motor impulsiveness (acting on the spur of the moment), 3) self-control (planning and thinking carefully), 4) cognitive complexity (enjoy challenging mental tasks), 5) perseverance (a consistent lifestyle), and 6) cognitive instability (thought insertions and racing thoughts). Using oblique rotations, three secondorder factors were also identified: 1) attentional (combined first-order factors 1) and 6), 2) motor (combined first-order factors 2 and 5) and 3) nonplanning (combined first-order factors 3 and 4) impulsiveness. Evidently, two of the factors (motor and nonplanning impulsiveness) were consistent with results of past studies (e.g., Barratt, 1985; Luengo et al., 1991). However, the third factor (attentional impulsiveness, defined as an inability to focus attention or concentrate), despite a heavy load of cognitive items, was not exactly the "cognitive impulsiveness" subtrait Barratt had originally conceptualized (Barratt, 1985). Rather, in Patton et al.'s (1995) model, cognitive items loaded on all of the factors, suggesting that cognitive processes underlie impulsiveness in general (for a full description of the BIS-11, please refer to Appendix E).

The study by Patton et al. (1995) is considered the 'original' factor structure study of the BIS-11, and many other studies have subsequently been undertaken in the attempt to validate its results among various populations (e.g., Someya et al., 2001, Fossati, Di Ceglie, Acquarini, & Barratt, 2001; Ireland and Archer, 2008; Haden & Shiva, 2009). However, research thus far, conducted all over the world, has not systematically confirmed Patton et al.'s (1995) three-factor structure. Rather, as a whole, results have reinforced the idea that the BIS taps into different components of impulsiveness in different samples. Differences in culture and life experience may certainly impact how impulsivity is expressed (behaviourally, cognitively, and interpersonally) and how it is perceived socially. Thus, context is extremely important.

1.5 The BIS-11a 'problem'

According to Stanford et al. (2009), the BIS-11 by Patton et al. (1995) is the most up to date and psychometrically sound version of the BIS. Therefore, no other versions of the measure should be used, unless the objective is to make comparisons with data collected using an earlier version. The authors particularly warn against using the BIS-11a, which was a mere 'partial analysis' of BIS-10 data. Although it was distributed to several research teams for review, they report that this 'working' version of the scale has been more widely disseminated than was ever intended or anticipated by Barratt and his colleagues.

However, in reviewing the extant literature, it is abundantly clear that Stanford et al.'s (2009) caution has not been heeded. Studies are not only using the BIS-11a, but many are erroneously reporting its item content, factor structure, and/or appropriate referencing. To illustrate, Forbes, Brown, Kimak, Ferrell, Manuck, and Hariri (2007) mention using a 30-item version of the BIS and cite Barratt (1994), which would mean that the BIS-11a was used. However, in their description of the measure's factor structure, they describe that of the BIS-10 (i.e.,

cognitive, motor, and nonplanning impulsiveness). Gorlyn, Keilp, Tryon, and Mann (2005) as well as Keilp, Sackeim and Mann (2005) went a step further by actually imposing the BIS-10 factor structure on BIS-11a items in their respective studies. Similarly, Hälbig, Tse, Frisina, Baker, Hollander, Shapiro, et al. (2009), erroneously associated the factor structure of the BIS-11 (attentional, motor, and nonplanning impulsiveness; Patton et al., 1995) with the BIS-11a (properly cited as Barratt, 1994). Hinson, Jameson, and Whitney (2003) claimed to have used the BIS-11 and cite Barratt (1994), which would mean the early version BIS-11a. However, they say that the scale is composed of 34 items, indicating the BIS-10 (Barratt, 1985). Grisso, Davis, Vesselinov, Appelbaum, and Monahan (2000) also cite Barratt (1994) even though they report to have used the BIS-11 (Patton et al., 1995). Furthermore, they mistakenly describe the measure as consisting of 29 items, and refer to its factor structure as that which actually belongs to the BIS-10 (Barratt, 1985). Finally, even a very recent study by Völlm, Richardson, McKie, Reniers, Elliot, Anderson, et al. (2010), used the BIS-11a as their measure, yet improperly referred to its factor structure as well as its authorship as those belonging to the BIS-10 (Barratt, 1985).

1.6 Objectives

Clearly, the aforementioned studies attest to the resounding confusion present in the impulsiveness literature surrounding the BIS-10, 11a and 11 (Barratt, 1985; Barratt, 1994; Patton et al., 1995, respectively). The BIS-11a only shares 24 out of 30 items in common with these other two versions of the BIS. Therefore, conceptually speaking, their scores cannot be accurately compared (Stanford et al., 2009). Logically, it follows that the factor structures between these instruments also cannot be accurately compared to one another, given the significant differences in item content between the versions.

Another reason why Stanford et al. (2009) recommend against the use of the BIS-11a is that, given its limited psychometric development, it is not a reliable or valid measure of impulsiveness. Interestingly, the only study they cite in support of this assertion is Barratt (1994) – that is, the study responsible for the BIS-11a's existence. However, according to our review, no studies have actually discredited the validity or reliability of the BIS-11a. Rather, the problem is that no studies have even attempted to validate Barratt's factor structure (1994) at all. Instead, studies have been liberally using the BIS-11a as an instrument, but attributing to it factor structures (and references) that in fact belong to different versions of the scale. Our study, therefore, hopes to elucidate this confusion surrounding the BIS-11a by aiming to replicate Barratt's (1994) original factor structure (i.e., ideo-motor, careful planning, and coping stability) using a large general population sample. Given that the factor structure of the more widely used BIS-11 remains, to this day, highly inconclusive (Ruiz, Skeem, Poythress, Douglas, & Lilienfeld, 2010), it is worthwhile to examine alternative versions of the scale - especially one that has so far remained unexplored and is still extensively used. Thus, our primary goal is to validate both the construct and the internal validity of the BIS-11a. Our secondary objective is to evaluate these properties for a French version of the scale.

METHODS

2.1 Setting

The study was conducted using data collected through the psychiatric epidemiological catchment area (ECA) study in southwest Montreal (Caron et al., 2007), whose objective was to survey mental illness, mental health and quality of life of a representative sample of the adult population aged 15 to 65 in the target catchment area: the southwest of Montreal, Quebec. This region was chosen as the target catchment area due to its numerous characteristics that facilitate the creation of a delineated epidemiological zone: 1) a varied sociodemographic and ethnic composition, 2) its own socioeconomic profile and community organization, and 3) widespread poverty. One third of the sample was classified as after-tax "low-income", meaning an annual income of \$27,745 or less (Caron et al., 2007). To put this into perspective, the average income in that same year for families³ in Canada was CAN \$70,700 (Statistics Canada, 2008). In addition, the catchment area is geographically situated around a large mental health institution in a metropolitan area, the Douglas Mental Health University Institute.

2.2 Participants

The southwest of Montreal has 198,585 inhabitants aged 15 to 65 (total population 269,720), and encompasses four boroughs: Saint-Henri/Pointe-St-Charles (population aged 15 to 65: 29,680), Lachine/Dorval (42,850), Lasalle (53,635), and Verdun (72,420) (2006 Census data). The goal of the ECA study was to sample 600 participants in each borough, for a total sample size of 2,400

³ Defined as a group of individuals sharing a common dwelling unit who are related by blood, marriage (including common-law relationships) or adoption.

participants. This sample size is comparable to those of psychiatric epidemiological areas that have been conducted in American cities with similarly sized populations (Régier & Kaelber, 1995; Tohen, Bromet, Murphy, & Tsuang, 2000). Individuals between the ages of 15 and 65 were eligible to participate. They had to speak English and/or French, and currently be a resident of southwest Montreal. Individuals were excluded for participation if they did not meet the age criterion, they did not have a sufficient command of either English or French, they had a severe cognitive impairment that prevented them from comprehending questions, or they had plans of moving out of southwest Montreal in the subsequent two years.

2.3 Measures

All ECA study participants were administered in-person interviews by interviewers with at least a Bachelor's degree in the human or social sciences. All interviewers received training in order to assist any participants in the event of psychological distress resulting from the interview. Each interview consisted of a large battery of measures, covering domains such as mental health, quality of life, and access to services. However, for the purpose of the current study, we only used information gathered from the sociodemographic questionnaire, as it allowed us to obtain a general description of the nature of our sample, as well as the BIS-11a (Barratt, 1994), which assessed participants' levels of impulsiveness.

Sociodemographic questionnaire. The following sociodemographic variables were gathered through a short self-report questionnaire from the Canadian Community Healthy Survey (CCHS) – Mental Health (version 1.2;

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Statistics Canada, 2002): age, sex, marital status, education, mother tongue, ethnic origin, and highest obtained education level.

Barratt Impulsiveness Scale, version 11a (BIS-11a). As previously described, the BIS-11a (see Appendix C) is composed of 30 items that contain both behavioural and personality descriptions of impulsive tendencies. Each item is answered on a 4-point Likert scale (Rarely/Never [1], Occasionally [2], Often [3], Almost always/Always [4]), with no available neutral response. Seventeen of the 30 items (2, 3, 4, 9, 12, 14, 15, 16, 18, 20, 21, 23, 25, 26, 27, 28, 29) were scored according to this gradation, wherein a score of Almost always/Always [4] reflects highest impulsiveness. However, for the remaining 13 items, a response of Rarely/Never reflects highest impulsiveness, so these items were reversely scored: Rarely/Never [4], Occasionally [3], Often [2], Almost always/Always [1]. In terms of total score, the possible range is 30 (minimum) to 120 (maximum), with a higher total score indicating higher overall impulsiveness.

The sub factors generated by this scale have only been explored by Barratt (1994) himself, using small samples of college students (N = 151) and psychiatric inpatients (N = 92). The three factors he gathered were: ideo-motor impulsiveness (items 9, 2, 29, 27, 10, 7, 4, 12, 23, 19, 26, 21), careful planning (5, 1, 18, 8, 15) and coping stability (11, 30, 17, 20, 13, 16, 22, 25). Despite the fact that many studies have used the BIS-11a "working" version of the BIS-11 (such as Forbes et al., 2007; Hälbig et al., 2009; Hinson et al., 2003; Grisso et al., 2000; Völlm et al., 2010), the BIS-11a and its factor structure were never properly replicated and validated in samples other than the original Barratt (1994) study. Thus, there are unfortunately no psychometric indices to report.

L'échelle d'impulsivité de Barratt, version 11a. The English version of the BIS-11a was translated into French by the ECA research group using backtranslation. That is, two research assistants first independently translated the instrument into French while remaining faithful to its format. A consensus among these two translations was reached, and this final copy was then submitted for retranslation back into English by a separate research assistant. Validity of the translation was thereby achieved. Baylé et al. (2000) had employed this exact method in their translation of the BIS-10 from English to French (the only published translation of the BIS in French to date), and they reported that this technique had not given rise to any problems. Furthermore, a previous study by Baylé, Chignon, and Adés (1993) interviewed over 200 French-speaking patients, who had previously responded to the BIS-10, on their difficulty comprehending the items. Results showed that only Item 6 ("J'ai des idées qui fusent"; equivalent to Item 4 of the BIS-11a) was considered difficult to comprehend. Moreover, this difficulty was only experienced by less than 10% of subjects, and they were nonetheless still able to respond to the item. Therefore, the authors concluded that the face validity was preserved. Based on these results, we do not believe that certain items of the BIS-11a got "lost in translation" from the English to the French version.

2.4 Procedure

Ethics and confidentiality. The ECA project was approved by the Research Ethics Board of the Douglas Mental Health University Institute. Participants were initially asked to sign a research consent form (see Appendix A). In addition, the master list, linking each participant's ID numbers with their full name, was kept in a locked location that was only accessible to research assistants and researchers working on the project.

Sampling plan. The objective of the ECA study objective was to obtain a representative sample of the targeted population, both geographically, i.e. recruiting participants from all areas of the territory, as well as in proportion to the population density and in terms of socioeconomic status, that is, representative of the educational attainment structure of the territory. A target sample of 3,708 addresses was selected for recruitment. The research team used a list of addresses provided by the 2004 valuation role and attributed excepted response rates based on the 2001 Census educational attainment of the Enumeration Area, the smallest census unit, with an average of 427 people aged 15 to 69.

Participants were first contacted by phone and 300 people were recruited. However, it was soon decided to proceed otherwise due to the low response rate compared to the number of potential participants who were randomly selected. In order to improve recruitment, the original selected addresses were extended to a range of 14 neighbouring addresses. This range of 14 potential addresses included the original address, the three addresses that were the closest on each side of the main address, and the seven addresses on the opposite side of the street. The team used 3,408 addresses for door-to-door recruitment; the 3,408 original addresses hence resulted in 3,408*14 neighbouring addresses, representing theoretically, a potential of 47,712 addresses where people would be available for recruitment. Ultimately, 7,265 people were met in person and, from those, 3,726 (51.2%) refused to participate. Amongst the 3,539 people who accepted to participate, 1405 (19.34%) were not eligible and 2,134

participants completed the interview for a cooperation rate of 48.7%. This rate is superior to the median rates reported in epidemiological studies of populations conducted after the years 2000, when there was a steady decline in participation rates over the past 30 years (Morton, Cahill, Hartge, 2006; Singer, 2006).

Interview. Interviewers contacted the potential participants via phone, in the same week, in order to schedule a face-to-face meeting either at the participant's home or in a designated office. Upon arrival to the interview, participants were first asked to sign a consent form in accordance with Tri-Council guidelines and procedures (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada, 2010). Research assistants collected the information from the interview and used pre-programmed laptop computers in order to avoid coding errors. Interviews ranged from 20 to 295 minutes, with an average length of 102 minutes (SD = 38 minutes). The length of each interview depended on whether or not the participant had any mental health issues and had utilized mental health services.

After the interview was completed, participants were paid twenty dollars as compensation. One month after each interview, each participant received a letter thanking him or her for participating in the study.

Analytic procedure. Descriptive and reliability analyses were performed using PASW Statistics v. 17.0 (SPSS: An IBM Company) whereas confirmatory factor analyses were conducted with AMOS version 7.0 (Arbuckle, 2006).

PASW was used to generate descriptive statistics regarding the sociodemographic attributes of our sample. It was decided that although the

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majority of the sample probably spoke both French and English - amongst perhaps other languages - those participants who chose to complete the interview in French were considered the "French subgroup" and those who chose English the "English subgroup". Presumably, if they chose to perform the interview in French as opposed to English, then they most likely felt more comfortable speaking the former (and vice versa for English interviews). PASW was also employed to determine the mean scores (and standard deviations) for the BIS-11a total score and each of the three subscales, for both the French and English subgroups. Internal consistency reliability rates (Cronbach's alpha) were computed with PASW for each language group, concerning their total BIS-11a score as well as the three subscale scores.

Finally, AMOS was used to perform separate confirmatory factor analyses (CFA) of the BIS-11a for our French and English groups, in our attempt to validate Patton et al.'s (1995) three factor model across both language versions of the BIS-11a.

RESULTS

3.1 Participants

Based on the aforementioned inclusion and exclusion criteria, 2,433 individuals aged 15 to 65 were randomly selected from the target catchment area of the study. Separate sociodemographic analyses of the English and French subsamples revealed certain differences between the two language groups (refer to Table 1 for a detailed breakdown of these variables).

For the one continuous sociodemographic variable – age – an independent samples t-test was performed in order to examine its association with language of

interview. Results showed that the null hypothesis could not be rejected. In other words, there was no statistically significant difference in age observed across the two language groups, t (2418) = .44, p > .05.

Furthermore, a series of Pearson chi-square analyses were executed to examine the associations between language of interview and the remaining categorical sociodemographic variables. Results demonstrated that language of interview had a statistically significant association with both marital status ($\chi^2 =$ 47.94, p < .05) and highest obtained education level ($\chi^2 = 17.64$, p < .05). In reference to Table 1, it is clear that the French sample had a higher proportion of participants in long-term relationships (married or common law) – specifically, 47% as opposed to 41.7% of the English sample. The French sample also had a somewhat higher proportion of participants (55%) that had a CEGEP, trade or university degree, as opposed to English (51.6%). In addition, language of interview had a significant association with the following ethnicities: White ($\chi^2 =$ 124.88, p = .00), South Asian (χ^2 = 42.29, p = .00), Filipino (χ^2 = 17.75, p = .00), Chinese ($\chi^2 = 55.25$, p = .00), Black ($\chi^2 = 61.77$, p = .00), and Other ($\chi^2 = 26.58$, p = .00). Generally, the French sample was more likely to have Caucasian participants whereas the English sample was more likely to have African-American participants or other minorities. Finally, language of interview did not have a statistically significant association with gender.

3.2 Missing data

Data screening was undertaken prior to statistical analyses in order to detect, diagnose and correct any anomalies in the data. After screening both language datasets for participants with any missing data (i.e. from missing one item on the scale to missing all 30 items), it was discovered that a total of 280 of the 2,433 participants had items missing on their BIS-11a responses, which corresponds to 11.5% of the participants in total. Of these 280, nine did not answer any of the items on the BIS-11a (or they had indicated to the interviewer that they either did not know the answers to the items or they refused to answer the items), six had more than six items (20%) missing from the scale, and 265 participants had one (3%) to five (17%) of items missing. Over all, nearly 20% of participants had at least 10% of items missing from the BIS-11a questionnaire.

These 280 participants with missing data were then compared to those participants without missing data on two sociodemographic variables (age and gender) to look for any patterns that might suggest the presence of a systematic bias. In other words, whether some respondents had chosen not to answer one or more items for some reason unknown to the researcher (Duffy, 2006). This task was crucial, given that the pattern of missing data has been shown to be more important than the amount of missing data (Tabachnick & Fidell, 2007). No evidence of a systematic bias was found, thus implying that the data were missing at random.

Studies have shown that when only a few data values, usually 10% or less, are absent in a haphazard fashion from a large dataset (such as ours), almost any procedure for handling missing values can be used (Tabachnick & Fidell, 2007). The default option in most statistical packages for randomly missing data is to use either listwise or pairwise deletion of cases (Duffy, 2006). Listwise deletion (i.e. using only those cases with complete data on all variables) seemed like the most sensible method to employ in our study for two reasons. First of all, given that the

goal of the study is psychometric as opposed to population-based, deleting participants with any missing cases, as opposed to estimating missing data through mean imputation, seemed more advantageous to our goal as it ensured a more precise reflection of our raw data. On the other hand, had the aim of our study been clinical in nature then mean imputation would have been favourable, as it would have allowed for a more extensive commentary on features of our study population. Secondly, given the very large sample sizes of both language groups of data, removing 280 cases from a total of 2,433 did not pose a threat to statistical power. As noted by, Tabachnik and Fidell (2007), in small sample sizes, missing data on several key study variables may greatly reduce the sample size and degrees of freedom when running analyses, and in turn seriously reduce the power of the study to detect significant relationships in the data. However, given that a mere 11.5% of cases were dropped from subsequent analyses, there were a sufficient number of cases to assure sufficient statistical power.

3.3 Descriptive statistics

After employing listwise deletion, 1,450 participants were left in the French language group and 703 participants in the English group. Group means were generated to determine the mean total score and subscale scores for both the English- and French-speaking samples. The results of these analyses can be seen in Table 2. A one-way analysis of variance (ANOVA) was also conducted in order to examine group differences in impulsiveness scores. Results showed that the language groups did significantly differ in their BIS-11a total scores (F (1, 2367) = 61.37, p = .00). However, only 3% of the variability in total score could be accounted for by language (i.e., the effect size was very small). The same

pattern emerged for the ideo-motor and coping subscales. For the ideo-motor subscale, the scores significantly differed across the samples (F(1, 2367) = 15.04, p = .00), but language only accounted for around 1% of score variability. For the coping subscale, there was also a significant difference (F(1, 2367) = 14.90, p = .00), but again language only explained around 1% of score variability. Finally, there was no significant difference between the samples on the planning subscale.

Given the differences found between French and English samples in ethnic origin, education, and marital status, a one-way analysis of covariance (ANCOVA) was subsequently performed in order to test for sample differences in impulsivity while holding sociodemographic variables constant. First, the homogeneity of variances assumption was tested by the Levene's test for the equality of error variances (Levene, 1960). None of these tests, for the BIS-11a total score as well as the subscale scores, were statistically significant. Therefore, the null hypothesis (i.e., the variance between groups is homogeneous) could not be rejected, thereby satisfying the assumption. The assumption of the homogeneity of regression slopes was also tested by seeing if any of the covariates (age, sex, marital status, educational background, and ethnic origin) significantly interacted with the independent variable - language of interview across the BIS-11a total and subscale scores. None of these many interaction terms were significant, implying that the ANCOVA could be run to test for the main effects of language of interview on BIS-11a score (Green & Salkind, 2011). Results showed that the language difference in BIS-11a total scores remained statistically significant (F(1, 2284) = 5.64, p < .05) even after controlling for age,

gender, marital status, education, and ethnic origin. However, the effect size of language dropped from 3% to .2%. In terms of the subscale scores, the ideo-motor scale score was the only one to yield a significant difference across languages (F (1, 2284) = 3.83, p = .05). Again, however, language explained .2% in score variability. Furthermore, whereas the coping subscale had previously been found to significantly differ across samples in the ANOVA, when sociodemographic variables were controlled for, this difference was no longer statistically significant. Finally, the planning subscale still failed to yield a statistically significant language difference in the ANCOVA.

3.4 Internal consistency reliability

Reliability analyses for the BIS-11a total score, as well as each of the three a priori factors, were conducted separately for English and French versions of the scale. Cronbach's alpha (Nunnally, 1978) was used to validate the internal consistency of the subscale and total scores – that is, to measure the homogeneity of items in each of these scales. Please refer to Table 3 for a breakdown of the alpha coefficients for both the English and French versions of the BIS-11a.

3.5 Confirmatory factor analysis (CFA)

Two separate CFAs (one for the English sample and another for the French) were undertaken in order to determine if our hypothesis was accurate – that is, that Barratt's (1994) original factor structure could be replicated in our data, across both language versions of the scale. CFA was chosen as a means to explore this question because it is considered the ideal method to either confirm or invalidate a model (Corbière et al., 2002). As aforementioned, Barratt's (1994) a priori model consists of the following three dimensions of impulsiveness: ideo-

motor (12 items), careful planning (5 items), and coping stability (8 items). It should be noted that, although the BIS-11 was constructed to operationalize three dimensions of impulsivity, the three components are not actually thought to be orthogonal (Miller et al., 2004). Rather, they all correlate with one another. Therefore, in keeping with one of these basic principles of CFA, we added covariances between the three factors to reflect their correlation (Kline, 2010). Furthermore, all models were recursive, identified, and standardized with variances set to 1.00.

Model fit. Adjustment indices were used to measure the fit of the Barratt (1994) model to both the English and French data. For the English sample (n = 703), Barratt's (1994) three-tiered model fit the data well. Its fit was judged satisfactory since the majority of fit indices⁴ met the following criteria (see Table 4): its minimum discrepancy divided by degrees of freedom (CMIN/df, i.e. chi-square statistic) ratio of 5.32 was just at the upper threshold of 5 (a superior fit would be below 5; Thomson, MacInnis, & Park, 2005), the Goodness of Fit Index (GFI) was extremely close to the cutoff value of .85 (a superior fit would be above .85; Someya et al., 2001), the Adjusted Goodness of Fit Index (AGFI) was approximately .80 (which is considered the cutoff; Someya et al., 2001), and the root mean square error of approximation (RMSEA⁵) was below the appropriate cut off of .10 (Byrne, 2001). It should be noted, however, that the model did not meet other standards of good fit. First, the Comparative Fix Index (CFI) value was

⁴ There are hundreds of measures of fit, but the ones listed here are some of the more major ones currently used in the literature.

⁵ RMSEA is currently the most popular measure of model fit and is reported in virtually all papers that use CFA (Kenny & Kashy, 1992).
below the cutoff of .90, suggesting poor fit. Secondly, the Parsimony Comparative Fit Index (PCFI) was below the threshold of .8, also suggesting poor fit. However, other sources say that there is no commonly agreed-upon cut-off PCFI value for an acceptable model. Finally, the p-value of the chi-square statistic was significant. Typically, a smaller and insignificant chi-square (χ^2) value indicates a better fitting model. However, as has been reported in the literature (Schumacker & Lomax, 2004), the chi-square test may be misleading. Specifically, χ^2 is sensitive to sample size. For models with about 75 to 200 cases, the chi-square test is a reasonable measure of fit. But for models with more cases (400 or more), the chi-square is almost always statistically significant (Kenny & Kashy, 1992). This is because the chi-square values will typically be inflated (statistically significant), and thus erroneously imply a poor data-to-model fit. In fact, at larger sample sizes, power is so high that even models with only trivial misspecifications are likely to be rejected. Therefore, the larger the sample size (and ours are considerably large), the more likely the rejection of the model *and* the more likely a Type II error (i.e., rejecting something true). For these reasons, and given the large sample size of the English group, the significant p-value and undesirably high chi-square statistic can be considered negligible.

The model fit index of the French sample (n = 1,450) was strikingly similar to that of the English sample despite the former group being double in size. To illustrate (see Table 4), the GFI, CFI and PCFI values of the French sample (.86, .64, and .58, respectively) were virtually identical to those of the English sample, and the AGFI was even slightly better. Additionally, the French RMSEA was .07 as opposed to the English .08, suggesting a superior fit of the model to the French data. Finally, the CMIN/df ratio of the French subset was quite poor, with a high and significant value of 8.76 (compared to the English 5.32). However, for the reasons previously mentioned, the significant p-value and high Chi-square statistic for our extremely large French sample can be considered negligible and the alternative measures of fit should instead be taken into account.

Factor loadings. For an illustration of the factor loading of each item with its corresponding factor, please refer to Table 5. This table presents not only the factor loadings of each item within the English and French samples, but also the factor loadings yielded in Barratt's (1994) original study (which administered the English-version BIS-11a to 151 college students). A comparison of the factor loadings yielded in our study with those found in Barratt (1994) reveals several discrepancies. First, the ideo-motor impulsiveness subfactor, which demonstrated the highest internal consistency reliability in our study and the second highest in Barratt (1994), shows the most impressive factor loadings out of the three subfactors. However, items 9 ("I find it hard to sit still for long periods of time"; 0.37 English and 0.30 French) and 23 ("I walk and move fast"; 0.15 English and 0.05 French) did yield much lower loadings onto the ideo-motor factor in comparison to the Barratt (1994) study (0.58 and 0.40, respectively).

The careful planning subscale, despite its satisfactory internal consistency reliability for the English sample (0.65) showed far poorer reliability in the French sample (0.51). Accordingly, the factor loadings for all five items in the French group were lower than the English group, save for Item 8 ("I save regularly"; 0.31 English and 0.48 French). Factor loadings for Items 5 ("I plan trips well ahead of time"; 0.42 English and 0.36 French) and 1 ("I plan tasks carefully"; 0.39 English

and 0.26 French) are also noticeably lower in comparison to Barratt's (1994) corresponding rates (0.75 and 0.72, respectively).

The final factor, coping stability, which yielded the lowest internal consistency reliability rates in both the current study (0.45 English; 0.44 French) and the Barratt (1994) study (0.50), also globally had the lowest factor loadings out of the three factors. Item 17 ("I have regular medical-dental check ups") yielded a much higher loading in the English sample (-0.27) than in the French sample (-0.13). Conversely, Item 13 ("I like to think about complex problems") yielded a much higher factor loading in the French sample (-0.13). Lems 11 ("I plan for job security"; -0.33 English and -0.38 French), 17 ("I have regular medical-dental check ups"; -0.27 English and -0.13 French) and 20 ("I change where I live"; 0.23 English and 0.15 French) also showed far lower loadings in our study than in the Barratt (1994) study (0.59, 0.52, and 0.46, respectively).

Interfactor correlations. As previously mentioned, Barratt's (1994) three subfactors of impulsiveness are not considered to be orthogonal – rather, they all correlate with one another (Miller et al., 2004). Accordingly, covariances between the three factors were incorporated into our confirmatory factor analyses (Kline, 2010). For a breakdown of the correlations between the three factors (ideo-motor impulsiveness, careful planning, and coping stability), within each of the language group, please refer to Table 6. Evidently, all interfactor correlations are positive and high (range of .86 - .96 for English sample and .84 - .94 for French).

DISCUSSION

4.1 Construct validity of the BIS-11a

The results of the ANOVA and ANCOVA analyses show that while the two language samples did significantly differ in their BIS-11a total scores as well as their ideo-motor and coping subscale scores, language only explained a very small proportion of variability. Furthermore, this proportion became even weaker after controlling for sociodemographic variables. These findings suggest that sociodemographic characteristics, such as ethnic origin, marital status, and educational background, may have more of an influence on BIS-11a score than language. This is good news, psychometrically, for it implies that the results of the BIS-11a are not biased by whether the original English version was administered versus a translated version. This also supports the idea that the BIS-11a truly taps into and measures impulsivity which, as aforementioned, is considered to be effected by both genetic (e.g., ethnicity) and environmental (e.g., educational background, marital status) factors (Buss & Plomin, 1975). In this way, our ANCOVA results attest to the construct validity of the BIS-11a – that is, it measures the theorized psychological construct that it purports to measure (Cronbach & Meehl, 1955).

However, despite these statistically significant differences, it should be noted that due to the large sample sizes, the means and standard deviations yielded would have to be nearly identical in order to not statistically differ at the .05 level. Therefore, it is possible that the differences observed between the language groups may in fact owe themselves to the large sample sizes and not actually be clinically or practically important (Hojat & Zu, 2004).

4.2 Internal validity of BIS-11a

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Internal consistency reliability. Cronbach's alpha represents the extent to which the items on a scale have high communalities and thus low uniqueness (Cortina, 1993). Although alpha is also a function of item intercorrelation, Cortina (1993) cautions that it must be interpreted with number of items in mind. According to past research, an alpha coefficient of at least .70 is recommended (Kline, 1998). In the original Barratt (1994) study based on a sample of college students, the alpha coefficients of the BIS-11a subscales were: .72 for 'ideomotor', .73 for 'careful planning', and .50 for 'coping stability'. With these aspects in mind in mind, it can be concluded that the alpha coeffecients for the BIS-11a total score – in both the English (0.82) and French (0.79) samples – were quite strong (refer to Table 4). Like in Barratt's (1994) study, the 'ideo-motor' subscale of each of our language groups was also fairly high (English: 0.71; French: 0.67), implying that the 12 items of this factor all seem to tap into an ideo-motor facet of impulsiveness. In terms of the smaller subscales, however, the coefficients in both language groups were weaker. However, it should also be taken into account that the alpha has a tendency to diminish as the number of items is reduced (Cortina, 1993). Thus, the coefficients for the 'careful planning' (5 items) and 'coping stability' (8 items), despite being significantly below 0.70, are not in and of themselves problematic. What is problematic, however, is that our 'careful planning' coefficients – in both language groups – were significantly lower in comparison to Barratt's (1994), who found the 'ideo-motor' and 'careful planning' subscales to be almost identical and quite high (.72 and .73, respectively). While 'careful planning' revealed acceptable internal consistency reliability in our English group (.65), it was quite lower in the French group (.51),

suggesting that the items did not collectively reflect this dimension in the French version BIS-11a. Another issue is the fact that the coefficients for 'coping stability' are lower (in both language groups) than those for 'careful planning', despite the former having a larger number of items than the latter. We would instead expect 'coping stability' (with 8 items) to have a higher alpha coefficient than 'careful planning' (with only 5 items), and in this way decrease as a function of the decrease in the number of items. This inconsistency signals that perhaps the constitution of the 'coping stability' subscale, in particular, needs to be re-evaluated.

Confirmatory factor analyses. In interpreting the results of our confirmatory factor analysis, a crucial element of concern is that the selection of which model fit indices to use is left to the discretion of the researcher, as are the ways in which to interpret the individual index statistics. There are, however, some common threads found within the literature. As Kenny and Kashy (1992) point out, most analysts believe in the value of fit indices, but caution against strict reliance cutoffs. Hu and Bentler (1999) echoed this sentiment by arguing that stringent criteria are more likely to reject adequate fitting models. On the other hand, they said, slightly less stringent thresholds - on a combination of indicators - do not dramatically alter error rates. Examining our results with this philosophy in mind, and therefore basing our findings on lenient criteria, both of our language samples demonstrate tolerable or acceptable fit to the original Barratt (1994) model. The GFI and AGFI indices in both groups were just at the borderline cutoff of fit. Additionally, the RMSEA was quite good in both samples, and certainly the most impressive out of all of the indices. This is crucial to our

interpretation, in light of the fact that the RMSEA is currently the most commonly used measure of model fit and is reported in virtually all papers that use CFA or other structural equation modeling (SEM) techniques (Kenny & Kashy, 1992). Furthermore, the fact that our weakest model fit index was the chi-square statistic – which has been proven to be an unreliable measure in samples above 400 subjects – also favours our hypothesis. For all intents and purposes, due to our large sample sizes, we can ignore this fit index in the interpretation of our results. Instead, seeing as the value criteria for three of the major fit indices in the literature (GFI, AGFI and RMSEA; Kenny & Kashy, 1992) were met (i.e. the adjustment indices reached the thresholds of significance required by the structural equation analyses), then the Barratt (1994) model can be considered to have good fit in both language groups. Therefore, as a whole, we can accept the Barratt (1994) model due to its correspondence to the data, and thus also accept our study's hypothesis.

Although the Barratt (1994) model showed satisfactory fit within each language group, it is important to examine the factor loadings of each item onto their corresponding factor in order to determine whether certain items might better fit onto a different factor. The factor loadings yielded in our CFA (see Table 5) show that, for the ideo-motor factor, items 9 ("I find it hard to sit still for long periods of time") and 23 ("I walk and move fast") yielded much lower loadings in our two samples than in Barratt's (1994). However, both of these differences can be explained by the fact that Barratt's (1994) sample consisted exclusively of college students, whereas ours were general population samples that each had an average age of around 40 years old. Item 9, in particular, is more relevant to

students (as opposed to adults) who spend much of their time sitting in classes. As well, for item 23, it is reasonable to assume that, on average, young students walk and move faster than middle-aged adults.

As previously mentioned, the majority of factor loadings for the second factor – careful planning – were lower among the French sample than the English (the exception being item 8). In other words, these items were more reflective of a careful planning factor for the English sample in comparison to the French sample. This disparity might be explained by sociodemographic differences between the two groups, such as marital status, highest obtained education level, or ethnicity – all of which, as previously stated, had significant associations with the 'language of interview' variable. The exact origins of this discrepancy are beyond the scope of this project. Nonetheless, our results attest to the idea that the careful planning subscale is better suited for the English version of the BIS-11a as opposed to the French.

Finally, the coping stability factor presented a number of noteworthy factor loadings. Both the English and French groups had strikingly lower factor loadings for items 11, 30, 17, and 20 in comparison to Barratt (1994). Again, however, we believe that these discrepancies are due to the nature of Barratt's college student sample as opposed to our general population samples. In particular, the items, "I plan for job security" (11), "I plan for the future" (30), and "I change where I live" (20), would surely resonate more strongly with a young student population in comparison to settled adults.

In addition, item 17 ("I have regular medical-dental check-ups") had a noticeably stronger loading onto coping stability in the English sample than in the

French. Conversely, item 13 ("I like to think about complex problems") had a higher loading onto coping stability in the French sample than the English. There could be various reasons for these differences, including cultural or, as aforementioned, sociodemographic. For the purposes of the current study, however, we can conclude that item 17 should perhaps be removed from the coping stability factor for the BIS-11a French version, and that item 13 be removed for the English version. Their removals would improve model fit.

The high degree of correlations between the three factors of the Barratt (1994) model (see Table 6) implies a high degree of overlap between the factors. That is, the three theoretically separate subfactors of impulsiveness are in fact highly convergent as opposed to discriminant. Consequently, it is difficult to distinguish among the factors. Of course, the three factors are reasonably expected to correlate, given that they are each meant to reflect a slightly different aspect within the much broader concept of impulsiveness (Miller et al., 2004). Hence, we accounted for these inherent overlaps in the CFA by initially adding covariances between the three a priori factors in order to reflect their correlation (Kline, 2010). However, the fact that the correlations in the English sample range from .86 - .96 and those of the French sample from .84 - .94 indicate that the factors within each language group were extremely highly inter-correlated. Unfortunately, the original Barratt (1994) study did not report the resulting interfactor correlations, so no comparisons to our sample can be drawn. However, these uniformly high interfactor correlations suggest that a higher order factor structure might provide the optimal model for the BIS-11a items (Flora, Finkel, & Foshee, 2003), for both its English and French versions. Therefore, a worthwhile area for future research

would be an exploratory factor analysis of the BIS-11a data, with a comparison of the resulting factors in relation to Barratt's (1994) original model.

4.3 Study limitations and strengths

All measures for our study that were used to gather data from the participants themselves were based on self-report – a kind of measurement that is often used but entails some significant limitations. First, self-report measures can be both vague and subjective. Furthermore, the results of self-report measures are completely dependent on the veracity of the respondent. Thus, due to the multiple responses biases (e.g. social desirability) that can distort self-reported responses, this kind of measurement is often avoided, especially among research exploring sensitive topics. Impulsivity is often studied in the context of aggression and violence - two socially sensitive behaviours that are particularly vulnerable to participant bias – therefore self-report indices are typically interpreted with this issue in mind. Self-report was nonetheless at the basis of our data collection because studies have shown that, in the context of research where confidentiality is ensured, participants are actually quite open in their responses on self-report measures (Rasinski, Visser, Zagatsky, & Rickett, 2004). Moreover, in a largescale epidemiological study such as the current one, self-report is likely the best and most efficient form of data collection due to the large amount of participants and the brevity with which these measures can be administered.

Another limitation of the study is the evidenced shortcomings of the BIS as a measure itself. As pointed out by Congdon, Klaus, and Canli (2008), the BIS is really only suitable for assessing multi-faceted, higher-order traits. It is far less suitable for evaluating components such as behavioural inhibition (a major aspect of impulsivity), which can be more accurately indexed by reaction times on behavioural measures (e.g. the stop-signal task). Additionally, the BIS is not sensitive to the newly discovered genetic variations that exist between high and low impulsive individuals. Congdon et al. (2008), for instance, failed to find significant differences on any subscale of the BIS-11 between their allele or genotype groups.

A noticeable flaw of past research in the area of impulsiveness is that the majority has focused on student samples. In fact, the failure to explore the factor structure of the BIS beyond undergraduate student populations has been a noted criticism by those attempting to define and conceptualize impulsiveness (Whiteside & Lynam, 2001). Aside from student samples, the remainder of research attempting to validate BIS-11 factor models has occurred in either clinical or correctional settings, two sampling characteristics that may significantly affect replication (Lenzenweger, 2006). Moreover, very few studies have focused on general population samples consisting of randomly selected individuals from the community. Thus, a definite strength of our study is the nature of our sample and the sampling procedure that was used to generate it. In addition, our sample sizes for both language versions (703 for English and 1,450 for French) are considerably large. The result of both of these attributes – that is, our extremely large and randomly generated community sample - is that our results can be said to generalize to the normal population.

A second notable strength of this study is the use of CFA as our main statistical analytic technique. There has been almost a complete absence of attempts among researchers in the field to thoroughly explore and confirm the BIS

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factor structures using more refined analyses, such as CFA (Ireland & Archer, 2008). Exploratory factor analytic techniques (e.g. Principal Components Analysis) have often been opted for instead, which are not as sophisticated or exacting as the confirmatory method. What is even more detrimental is that, despite the lack of CFA-based studies, many researchers simply take for granted that the much lauded three-factor solution of Patton et al. (1995) – in particular – will automatically apply to their sample. However, as pointed out by Ireland & Archer (2008), it cannot be assumed that this model will automatically transfer. It is crucial to explore and *confirm* measurement structure, rather than assume that a published structure will automatically apply to the population in question (e.g., Spinella, 2007). As it is, impulsivity as a concept is poorly defined and thus it cannot be assumed that the factor structures proposed for any published measures are fixed, particularly when there have been few studies confirming these structures using CFA (Ireland & Archer, 2008). The current study is therefore both critical and unique due to the incorporation of the CFA method.

4.4 Implications

Researchers have been examining the BIS for the past 50 years and, consequently, a number of modifications have occurred by Barratt and his colleagues in the continual attempt to improve the scale's validity and reliability. As one of the new studies in the current generation of BIS research, our study entails a number of important and implications. First of all, to our knowledge, this represents the first study that has aimed to replicate Barratt's (1994) three-factor model of the BIS-11a. It is also the first large-scale study to examine the factor structure of a French translation of any version of the BIS. In addition, the results

of our CFA – that is, the replication of the original Barratt (1994) factor structure in both English and French translations of the BIS-11a – support the scale's internal validity and thereby support its utility as a measure of impulsiveness among two of the most widely spoken languages around the world. Moreover, due the large, general population sample, the results allow for more to generalizability, which is an important feature in impulsivity research, given the universal nature of impulsiveness. In theory, the question of whether a person is capable or not of modulating their cognition and behavior to fit the demands of a given environment is crucial in almost any conceivable situation. As a result, there is widespread interest in understanding the role of impulsiveness among healthy populations across a wide range of activities, particularly employment behaviour, educational performance and criminality. Thus, whether or not the BIS is a valid measure of impulsiveness within normal, general populations is a worthwhile investigation, for if we can better measure impulsivity, then we can better understand it as a construct.

The fact that our large-scale study found support for Barratt's (1994) threecomponent structure is also significant. Due to the inherently complex nature of the construct of impulsivity, uncovering the factors that underlie impulsivity has considerable implications for both theory and practice. As argued by Smith, McCarthy & Zapolski (2009), the identification of one-dimensional factors within multifaceted constructs is critical for understanding causal processes and may make it possible to better identify targets for action aimed at changing the impulsive behaviour of a given individual or population (i.e. for treatment). It will also make it possible to follow the evaluation of the effectiveness of interventions, by narrowing in on subscale score improvement in the individual's particular problematic domain (Kalivas & Volkow, 2005). Treatments are only as good as assessment, and it is crucial to fine tune measurements as this helps professionals deliver more suitable and effective services, be they clinical, social, rehabilitative, or otherwise. Deciphering a valid and reliable factor structure of a measurement model is the first step in achieving this overarching goal.

4.5 Future studies

Generally speaking, establishing a valid and reliable factor structure of the BIS-11a would help advance theoretical understanding of impulsivity, as well as develop targeted interventions for the impulsive subtrait that underlies so many mental health problems, such as attention deficit-hyperactivity disorder, antisocial personality disorder, borderline personality disorder and alcohol abuse. Our study certainly represents a positive step in this direction. However, as highlighted by Kenny and Kashy (1992), a good fitting model does not necessarily mean a valid model. Continued research is needed because empirical replication provides critical evidence for construct validation (Smith et al., 2009). Therefore, the next steps in the validation process would include the measurement of inter-rater and test-retest reliability, as well as the concurrent, convergent, discriminant, and predictive validity of the BIS-11a. This is certainly fertile ground for future studies.

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Sociodemographic Characteristics of English (n = 782) and French (n = 1,638)

Samples

	English		French	
Characteristics	n	%	Ν	%
Age (Mean/SD)	40.53	14.14	40.80	14.09
Sex				
Male	367	46.9	805	49.1
Female	415	53.1	833	50.9
Marital Status				
Single	313	40.0	604	36.0
Married	258	33.0	453	27.6
Separated	27	3.4	41	2.5
Common Law	68	8.7	317	19.4
Divorced	100	12.8	196	12.0
Widowed	15	2.0	24	1.5
Ethnicity				
Caucasian	534	68.3	1,428	87.2
African American	110	14.1	82	5.0
Other minority	134	17.6	128	7.8
Mother tongue				
English	537	68.6	120	7.3
French	135	17.3	1,357	82.8
Other	106	14.1	161	9.9
Education				
No post-secondary diploma	58	7.5	141	8.6
Or certificate				
Trade/CEGEP	213	27.1	496	30.3
University certificate	191	24.5	404	24.7
/Bachelor's degree				
Graduate degree	66	8.5	167	10.2
Not applicable	254	32.5	430	263

Scale	English M (SD)	French M (SD)
	(n = 703)	(n = 1,450)
Total BIS-11a score	70.88 (7.68)	68.43 (6.75)
(30 items)		
Ideo-motor subscale	27.93 (4.23)	27.29 (3.81)
(12 items)		
Careful planning subscale	12.20 (2.19)	12.01 (2.15)
(5 items)		
Coping stability subscale	18.99 (2.94)	18.52 (2.69)
(8 items)		

Table 2Descriptive Statistics for the BIS-11a by Language of Interview

Internal Consistency Reliability of the BIS-11a

	English subset	French subset	Original Barratt
	(n = 703)	(n = 1,450)	(1994) study
Total BIS score (30 items)	0.82	0.79	
Ideo-motor subscale (12)	0.71	0.67	0.72
Careful planning subscale (5)	0.65	0.51	0.73
Coping stability subscale (8)	0.45	0.44	0.50

Model I'll Indexes for the Durrall (1994) I'dclor Structu	ure of t	he BIS-11a
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	CMIN/DF	Р	GFI	AGFI	CFI	PCFI	RMSEA	PCLOSE
English	5.32	.00	.78	.78	.66	.60	.08	.00
(n = 703)								
French	8.76	.00	.86	.83	.64	.58	.07	.00
(n = 1,450)								

Factor Loadings for the Barratt (1994) BIS-11a Model

	English	French	Barratt (1994)
	(n = 703)	(n = 1,450)	study
			(n = 151)
9. I find it hard to sit still for long periods of time.	.37	.30	.58
2. I do things without thinking.	.63	.60	.56
29. I am restless at lectures or talks.	.42	.40	.53
27. I have outside thoughts when thinking.	.56	.53	.49
10. I am a careful thinker.	47	56	47
7. I concentrate easily.	55	53	45
4. I have racing thoughts.	.39	.27	.44
12. I say things without thinking.	.54	.60	.44
23. I walk and move fast.	.15	.05	.40
19. I am a steady thinker.	51	56	37
26. I talk fast.	.31	.27	.36
21. I buy things on impulse.	.36	.43	.35

FACTOR 1: Ideo-motor impulsiveness (12 items)

FACTOR 2: Careful planning (5 items)

	English $(n = 703)$	French (n = 1,450)	Barratt (1994) study (n = 151)
5. I plan trips well ahead of time.	.42	.36	.75
1. I plan tasks carefully.	.39	.26	.72
18. I act on the spur of the	79	52	64

moment.			
8. I save regularly.	.31	.48	.58
15. I act on impulse.	73	66	53

FACTOR 3: Coping stability (8 items)

	English (n = 703)	French (n = 1,450)	Barratt (1994) study (n = 151)
11. I plan for job security.	33	38	.59
30. I plan for the future.	52	44	.53
17. I have regular medical- dental check ups.	27	13	.52
20. I change where I live.	.23	.15	.46
13. I like to think about complex problems.	12	30	.46
16. I get easily bored when solving thought problems.	.31	.34	.44
22. I finish what I start.	51	45	.43
25. I spend or charge more than I earn.	.36	.36	.37

Interfactor Correlation Matrices for the Barratt (1994) Model

	Ideo-motor impulsiveness	Careful planning	Coping stability
Ideo-motor impulsiveness	1.00	.90	.96
Careful planning	.90	1.00	.86
Coping stability	.96	.86	1.00

English version (n = 703)

French version (n = 1,450)

	Ideo-motor impulsiveness	Careful planning	Coping stability
Ideo-motor impulsiveness	1.00	.84	.94
Careful planning	.84	1.00	.91
Coping stability	.94	.91	1.00
Appendix A

Research Consent Form

Research Consent Form – General Population

Research project: Catchment area of epidemiological studies in psychiatry in south-western Montréal – Phase 1: Longitudinal epidemiologic study Canadian Institutes of Health Research Team in Social and Psychiatric Epidemiology

You are invited to participate in a research study conducted by the Canadian Institutes of Health Research Team in Social and Psychiatric Epidemiology, directed by Dr. Jean Caron, Ph.D., psychologist and principal investigator. Dr Caron is part of the Psychosocial Research Division of the Douglas Hospital Research Centre. For this research project, he is working with 15 other researchers, most of them from the same centre. This study is funded by the Canadian Institutes of Health Research. Your name has been randomly selected from a predefined list of street addresses.

Objectives of the study

The purpose of this study is to examine the links and interactions between personal factors, such as age and sex, the physical and socio-economic environment and the mental health of the population in six neighbourhoods in south-western Montréal: Verdun-Côte-St-Paul, St-Henri, Pointe Saint-Charles, La Salle, Lachine and Dorval. Two phases of data collection are planned – one in 2007 and a second in 2009 – so that the team can assess the evolution of respondents' mental health in relation to changes that occur in their personal lives or their environment. The study will contribute to better planning of prevention and treatment services in these neighbourhoods for persons who present or are at risk of developing mental health problems.

Description of the study procedure and your role

If you agree to participate in the study, you will be asked to answer a set of questions in the form of an interview. An interviewer will meet with you twice: once in 2007 and a second time two years later, in 2009. You will be asked the same questions in 2007 and 2009. The interviews can be done in your home or at the Research Centre, as you prefer. They will each last approximately two hours. You will receive \$20 at the end of each interview as compensation for your time.

The questionnaire covers four basic areas: 1) information such as age, sex, level of education, number of children, language, housing and income level; 2) mental health and quality of life; 3) ways one can deal with problems in life, including health-care services; and 4) your perception of your local community and physical environment.

The interview will cover a lot of information about your mental health – both positive aspects and emotional problems you may have. On the positive side, we will focus on your quality of life by asking you to assess your level of satisfaction with your daily life, social and personal relations, living environment and independence. You will also be asked questions aimed at detecting the most common mental health problems. These include conditions associated with emotional mood such as depression and bipolar disorder and also conditions involving stress and anxiety such as post-traumatic stress disorder and anxiety disorders. As well, you will be asked how often you have experienced the symptoms of psychological distress in the past month along with your use of alcohol and drugs and gambling habits. Other topics addressed will be impulsive behaviour, suicidal intent or attempted suicide, other violent behaviour and contacts with the justice system. Finally, participants who are 55 or older will be asked about cognitive disorders, like memory.

People don't all have the same life experiences and don't all react in the same way to problems they encounter, the demands of daily life or unexpected events. Some questions will also focus on your level of stress as well as the ways you deal with these situations. We will also ask you about the support you receive from your circle of family and friends.

One whole section of the questionnaire deals with your perception of your local community and environment. You will be asked about your sense of belonging to a community and how you view your ability to contribute to your neighbourhood. We will also ask you about your participation in community life. You will be asked for your opinions on problems in your living environment. Finally, you will be asked about mental health services in your neighbourhood and your opinion of the availability, use and quality of these services. In a different vein, we will want to know what you think of people's opinions about others who have received help for mental health problems.

We are asking you for your consent to participate in this study. Interviews with participants will take place between January and December 2007, and then between January and December 2009. If you agree to participate in the study, you are making a commitment to meeting with an interviewer twice, with each interview taking about two hours of your time.

Potential negative effects

So far as we know, your participation in this study will not have any negative effects for you. There may, however, be risks that are not known to us at the present time.

The only known inconvenience is the length of the two interviews. If you feel tired during an interview, you can take a break at any time you think is appropriate. If you think that a single two-hour interview may be too long, you can choose to meet with the interviewer a second time within two weeks of the first interview.

Potential benefits

You will not benefit directly from your participation in the study. However, the study has the potential to help you and others like you in the future. It will lead to a better understanding of the links between mental health and the factors that influence it. It will also contribute to better planning of services aimed at helping people who present or are at risk of developing mental health problems.

Potential mental health problem

As explained above, the questionnaire used will make it possible to assess your mental health. You have the choice of giving the research team permission to contact you if a possible mental health problem is detected, to inform you about the mental health services at your disposal if you feel the need to use them.

Participation and alternatives

Your participation is voluntary, and you may withdraw from the study at any time. Regardless of whether you decide to participate in the study, you will continue to benefit from all the health-care, social and community services to which you have the right. If you decide to participate and then change your mind later, you are free to do so and terminate your participation at any time. Regardless of your decision, you will continue to have access to quality services.

Confidentiality and Anonymity

Your confidentiality will be respected. No identifying information will be disclosed or published unless agreed on before hand or requested by law. To ensure confidentiality, a number will be used instead of your name when data from the interview is put together. The master list of names will be kept under lock and key in a secure location, and will only be used by members of the research team for the sole purpose of linking data from various questionnaires for the same respondent. Only the researchers and the research co-ordinator will know which name is associated with a given number. The master list of names will be destroyed one year after the end of the study.

Publication

When research results are published, you as an individual with remain anonymous because data will only be presented for the group as a whole.

Commercialization and conflict of interest

The data will never be used for commercial purposes by members of the research team or anyone else. The objectives of this research are basically to further knowledge for the purpose of improving social services and mental health services.

Consent and authorization to communicate with the respondent

In signing this consent form, you agree to participate in this study. You authorize Dr. Jean Caron's research team to contact you by phone in 2009 to have you participate in the second phase of the study. At that time, you will be asked to sign a new consent form.

We would also like to mention that there will be another three research projects related to this main study. These three studies will explore in more depth some of the topics addressed in the main study: mental health services, social stigma and social support. In the framework of these three supplementary studies, interview will be done with a certain number of the respondents participating in the main study. For the specific study on social stigma, the interviews will be conducted in 2008, while the study on the use of mental health services will be done in 2010. The final series of interviews, for the study on social support, will be conducted in 2011.

If you give us your authorization, you may be contacted to participate in the other three studies. As has just been mentioned, this is only a possibility, since not everyone participating in the main study will be contacted for the others.

Please make sure that any questions you may have are answered to your satisfaction and that you understand the study thoroughly. If the information you have received is not clear enough, or if you are not satisfied with the answers to your questions, you may contact:

Claire Robitaille, research coordinator Psychosocial Research Division Douglas Hospital Research Centre 6875 LaSalle Boulevard, Verdun (Québec) H4H 1R3 Tel: (514) 762-6131 extension 3461

Should you have any questions over the course of this study, you may contact Claire Robitaille at the address or phone number given above. You can also contact Dr. Jean Caron, at (514) 761-6131, ext. 3445.

If you have questions about your rights as a participant in this research, you can call the Douglas Hospital's Ombudsman, Francine Y. Bourassa, at (514) 761-6131, ext. 3287.

If you decide to participate in this study, you will receive a copy of this document.

I declare that:

- 1) I have read and understand the information provided about the study;
- 2) I understand that I may ask questions in the future;
- 3) I freely consent to participate in the project and I so attest by signing this consent form

I authorize Dr. Jean Caron or his representative to use the information I provide for research purposes.

If a member of the research team detects a potential mental health problem, I would like to be contacted and informed of the mental health services available to me if I feel the need to use them.

Yes _____ No _____

PARTICIPAN'S NAME (PRINT)

PARTICIPANT'S SIGNATURE DATE

PARENT'S NAME (PRINT) (IF APPLY) PARENT'S SIGNATURE (IF APPLY)

INTERVIEWER'S NAME (PRINT)

INTERVIEWER 'S SIGNATURE

Appendix B

Barratt Impulsiveness Scale, Version 10

Instructions: This questionnaire consists of thirty questions that ask you to rate how well certain statements apply to you. To answer these questions, please determine to what degree each of these statements applies to you and choose the appropriate response. How well does each of these statements describe you?

Response Scale: Never

Occasionally Often Always

- 1. I plan tasks carefully.
- 2. I do things without thinking.
- 3. I make up my mind quickly.
- 4. I am happy-go-lucky.
- 5. I don't "pay attention".
- 6. I have "racing" thoughts.
- 7. I plan trips well ahead of time.
- 8. I am self-controlled.
- 9. I concentrate easily.
- 10. I save regularly.
- 11. I "squirm" at plays or lectures.
- 12. I am a careful thinker.
- 13. I plan for job security.
- 14. I say things without thinking.
- 15. I like to think about complex problems.
- 16. I change jobs.
- 17. I act "on impulse".
- 18. I get easily bored when solving thought problems.

- 19. I have regular health check-ups.
- 20. I act on the spur of the moment.
- 21. I am a steady thinker.
- 22. I change residences.
- 23. I buy things on impulse.
- 24. I can only think about one problem at a time.
- 25. I change hobbies.
- 26. I walk and move fast.
- 27. I solve problems by trial and error.
- 28. I spend or charge more than I earn.
- 29. I talk fast.
- 30. I often have extraneous thoughts when thinking.
- 31. I am more interested in the present than the future.
- 32. I am restless at the theater or lectures.
- 33. I like puzzles.
- 34. I am future oriented.

Appendix C

Barratt Impulsiveness Scale, Version 11a

Instructions: This questionnaire consists of thirty questions that ask you to rate how well certain statements apply to you. To answer these questions, please determine to what degree each of these statements applies to you and choose the appropriate response. How well does each of these statements describe you?

Response Scale: Never

Occasionally Often Always

- 1. I plan tasks carefully.
- 2. I do things without thinking.
- 3. I make up my mind quickly.
- 4. I am happy-go-lucky.
- 5. I plan trips well ahead of time.
- 6. I am self-controlled.
- 7. I concentrate easily.
- 8. I save regularly.
- 9. I find it hard to sit still for long periods of time.
- 10. I am a careful thinker.
- 11. I plan for job security.
- 12. I say things without thinking.
- 13. I like to think about complex problems.
- 14. I change jobs.
- 15. I act "on impulse".
- 16. I get easily bored when solving thought problems.
- 17. I have regular medical/dental check-ups.
- 18. I act on the spur of the moment.

- 19. I am a steady thinker.
- 20. I change where I live.
- 21. I buy things on impulse.
- 22. I finish what I start.
- 23. I walk and move fast.
- 24. I solve problems by trial and error.
- 25. I spend or charge more than I earn.
- 26. I talk fast.
- 27. I have outside thoughts when thinking.
- 28. I am more interested in the present than the future.
- 29. I am restless at lectures or talks.
- 30. I plan for the future.

Appendix D

L'échelle d'impulsivité de Barratt, version 11a

Instructions: Les gens agissent et réfléchissent différemment devant des situations varéees. Ce questionnaire a pour but d'évaluer certaines de vos façons d'agir et de réfléchir. Lisez chaque énoncé et remplissez la case appropriée située sur la droite de la page. Ne passez pas trop de temps sur chaque énoncé. Répondez vite et honnêtement.

Échelle de réponses: Rarement/jamais

Occasionnellement Souvent Presque toujours/Toujours

- 1. Je prépare soigneusement les tâches à accomplir.
- 2. Je fais les choses sans réfléchir.
- 3. Je suis insouciant.
- 4. J'ai des idées qui défilent.
- 5. J'organise mes voyages longtemps à l'avance.
- 6. J'arrive bien à me contrôler.
- 7. Je me concentre facilement.
- 8. Je fais régulièrement des économies.
- 9. J'ai du mal à rester longtemps assis.
- 10. Je réfléchis avec soin.
- 11. Je veille à ma sécurité d'emploi.
- 12. Je dis les choses sans réfléchir.
- 13. J'aime réfléchir à des problèmes compliqués.
- 14. J'ai tendance à changer d'emploi.
- 15. J'agis sur des coups de tête.
- 16. Ca m'ennuie de réfléchir longtemps pour résoudre un problème.

- 17. J'ai régulièrement des bilans de santé (médicaux ou dentaires).
- 18. J'agis selon l'inspiration du moment.
- 19. Je suis quelqu'un de réfléchi.
- 20. J'ai tendance à changer de logement.
- 21. J'achète les choses sur des coups de tête.
- 22. Je finis toujours ce que je commence.
- 23. J'ai tendance à marcher et à me déplacer rapidement.
- 24. Je résous les problèmes par tâtonnements.
- 25. J'ai tendance a dépenser plus d'argent que je n'en ai.
- 26. Je parle vite.
- 27. Quand je dois me concentrer sur quelque chose, mes idées vagabondent.
- 28. Je m'intéresse plus au présent qu'a l'avenir.
- 29. Je ne tiens pas en place lors de conférences ou de discussion.
- 30. Je fais des projets pour l'avenir.

Appendix E

Barratt Impulsiveness Scale, Version 11

Instructions: This questionnaire consists of thirty questions that ask you to rate how well certain statements apply to you. To answer these questions, please determine to what degree each of these statements applies to you and choose the appropriate response. How well does each of these statements describe you?

Response Scale: Never

Occasionally Often Always

- 1. I plan tasks carefully.
- 2. I do things without thinking.
- 3. I make-up my mind quickly.
- 4. I am happy-go-lucky.
- 5. I don't "pay attention."
- 6. I have "racing" thoughts.
- 7. I plan trips well ahead of time.
- 8. I am self controlled.
- 9. I concentrate easily.
- 10. I save regularly.
- 11. I "squirm" at plays or lectures.
- 12. I am a careful thinker.
- 13. I plan for job security.
- 14. I say things without thinking.
- 15. I like to think about complex problems.
- 16. I change jobs.
- 17. I act "on impulse".
- 18. I get easily bored when solving thought problems.

- 19. I act on the spur of the moment.
- 20. I am a steady thinker.
- 21. I change residences.
- 22. I buy things on impulse.
- 23. I can only think about one thing at a time.
- 24. I change hobbies.
- 25. I spend or charge more than I earn.
- 26. I often have extraneous thoughts when thinking.
- 27. I am more interested in the present than the future.
- 28. I am restless at the theatre or lectures.
- 29. I like puzzles.
- 30. I am future oriented.