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Mental Well-Being and the Warwick-Edinburgh Mental Well-Being Scale  
(WEMWBS): an analysis of its psychometric performance in screening  
postnatal depression

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Tecniche di Valutazione Testistica in Psicologia Clinica

Relatore

Prof. Paola Gremigni

Presentata da

Margherita Chiara Ragonesi

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## INTRODUCTION

The increasing attention on mental health within the more general field of health has been followed by a clear shift in empirical research from an accent on mental disorders to focus on positive mental health.

Several papers have been retraced in the recent scientific literature in order to explore the construct of mental wellbeing (or positive mental health).

The Hedonic and Eudemonic perspectives, that have characterized current research on wellbeing, will be described in Chapter 1. Attention will be focus on their divergent philosophical roots and psychological views. Subjective Well-Being (SWB) and Psychological Well-Being (PWB) as two overlapping but distinct traditions of researchers from the two wider perspectives will be defined in term of their relevant dimensions, history and debate amongst authors around their implications. I will also report on the relationship between these two streams of empirical investigation and socio-demographic and personality factors. A recent reformulation of what I mentioned above will be provided as well.

Subjective Well-Being would comprise the hedonic and eudemonic streams which emphases positive emotion (Emotional Well-Being, EWB) and positive functioning (Psychological Well-Being, PWB and Social Well-Being, SWB), respectively. The measures of EWB, PWB and SWB were suggested to be able to provide a “diagnosis” of the mental health continuum comprising a range of languish, moderately mentally healthy, flourish and completely mentally healthy individuals. Flourish and moderately mentally healthy individuals may present mental disorders, while complete mental health is a condition in which subjects are

flourishing and without mental illness in the same time. This model surely supports the new research-trend that considers mental well-being and mental ill-being as two different dimensions, laying in two distinct but overlapped continua. In Chapter 2, this topic will be explored and principal predictors of well-being discussed. Evidence suggests that they are not in each case the same of those related to ill-being. Findings related to the direct influence on biological functions, such as hormonal and immune systems, will be reported to underline the close relationship between physical and positive mental health. The relevance of promoting positive mental health also in who has not mental ill-ness will be argued. Mental health is not merely the absence of mental illness. Positive mental health need to be better understood and a deeper understanding may be achieved with useful measurement scales.

In Chapter 3, several well-being measures will be listed. Some of the most used well-being measures will be presented. Recent tools whose aim is to provide a wider measure of well-being will be presented as well. Lastly, attention will be paid on a non-Western tool in order to underline the importance to keep in mind the cultural relativism related to the positive health notion.

A whole Chapter (4) will be dedicated to the Warwick-Edinburgh Mental Well-Being Scale (Tennant et al., 2007). Its aim, development, structure, psychometric properties, cross-culture validation studies, limitation and strength will be discussed.

Finally, in the last chapter our research will be presented. The main purpose was the validation of the ability of the WEMWBS to identify people at risk of post-natal depression, a relevant clinical condition in both mothers and fathers. The ROC curves, used to test this ability, will be described in depth. Results

on this specific psychometric performance of the WEMWBS will be illustrated and discussed.

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## CHAPTER 1: POSITIVE MENTAL HEALTH

The WHO declaration “there is no health without mental health” certainly underlines the prominence of mental health as component of good health and life quality and its influence on the functioning of individuals, families, communities and society. Traditionally, the mental health literature has focused principally on the investigation and treatment of mental illness. Nevertheless, there is growing attention in the consideration of the construct of positive mental health as a concept that is distinct from, and more than the absence of, mental illness (Barry, 2009). This has been demonstrated by a shift in the research literature from an accent on disturb to an attention on well-being and it is extremely evident in contemporary empirical psychology. Also epidemiologists, social scientists, economists and policy makers are appreciating this positive perspective (Huppert, 2009). This is aligned with the definition of health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” provided by the World Health Organization (WHO, 1948).

The terms positive mental health and mental wellbeing have been approved to describe initiatives focused on improving mental health as well as preventing mental illness. They were adopted in order to decrease the confusion around the use of “mental health”, term related to the initiatives in favour of individuals with mental disorders (Stewart-Brown and Janmohamed, 2008).

Mental well-being is a complex construct that concern the combination of feeling good and functioning effectively (Huppert, 2009). Around this, the World Health Organization provide a historic report conceptualizing positive mental health as a “state of well-being in which the individual realises his or her own

abilities, copes with the normal stressed of life, works productively and fruitfully and makes a contribution of his or her community “(WHO, 2001, p.1).

Accordingly to Deci and Ryan (2001), how we define well-being impacts our practice of government, teaching and therapy. Promoting positive mental health needs an understanding of how mental health is theorized and the nature of its determinants (Barry, 2009).

### **1.1 Hedonic and Eudemonic views**

Current research on well-being has been resulting from two broad perspectives: Hedonic and Eudemonic approaches (Deci and Ryan, 2001). Both traditions find its roots in ancient ages and reflect divergent views of human being and of what institutes a virtuous society. The two dissimilar philosophies inquire diverse questions regarding how developmental and social processes relate to well-being and prescribe distinct lines to the undertaking of existing.

The Hedonic view emphasizes happiness and describes well-being in terms of pleasure achievement and pain evasion. Hedonism approach has been articulated in various forms and has varied from a relatively narrow focus on physical pleasures to a more comprehensive concentration on appetites and self-interests.

The major view amongst hedonic psychologists is that well-being comprises of subjective happiness and relates the experience of pleasure versus displeasures construed to contain entirely appraisals around the good/bad aspects of the existence. As a result, happiness is not reducible to physical hedonism because it may be resulting from attainment of precious outcomes in several domains. Thus, psychologists who have accepted the hedonic view have inclined to emphasis on an extensive notion of

hedonism that embraces the requirements of the mind as well as the body. Hedonic psychology was described by Kahneman and colleagues (1999) as the study which investigates what creates experiences and existence enjoyable and not enjoyable. They supposed hedonism and well-being are fundamentally the same. Hedonic psychology, referring to wellbeing as pleasure against pain, established a limpid and explicit goal of research and intervention, that is exploited human happiness.

Associating well-being with hedonic pleasure or happiness could date back to fourth century B.C. At that age, Aristippus of Cyrene imparted that the objective of the existence is to experience the full extent pleasure and that happiness is the complete of hedonic moments for an individual. Numerous other thinkers tailed his initial philosophical hedonism. For instance, that happiness places in the successful search of human desires was contended by Hobbes and that pursuit of sensation and pleasure is the final aim of existence was thought by De Sade. Bentham such as the other utilitarian philosophers assumed that the good society is built through individuals' efforts to exploit pleasure and self-interest.

On the other hand, Eudemonic view emphasizes meaning and self-realization and describes well-being in terms of the levels to which an individual is completely functioning. Into this perspective, well-being embraces more than sole happiness. It places in the actualization of human capabilities.

Eudemonism is a philosophy perspective which demands individuals to know and to live in harmony with *daimon* or "true self". "The Daimod is an ideal in the sense of being an excellence, a perfection toward which one strives and, hence, it can give meaning and direction to one's life" (Waterman, 1993, p. 678). The daimon denotes the potentialities of every individual, the realization of which signifies the highest accomplishment in

existing of which each individual is skilled. He refers to both the potentialities of all humans and those sole potentials that differentiate each individual. The term *eudaimonia* reflects energies to live in unity with the daimon and appreciation of our potentialities (self-realization) (Waterman, 1993).

The term eudemonia is precious because it relates to well-being as distinct from happiness itself. Nevertheless, the common English translation for *eudaimonia* in *Nicomemachean Ethics* (Aristotle, 1985) is happiness and, in the current practice, the word happiness is generally used to denote hedonic happiness. In contrast, Aristotle evidently banned the Cyrenaic perspective of happiness “the many, the most vulgar, seemingly conceive the good and happiness as pleasure and hence they also like the life of gratification. Here they appear completely slavish, since the life they decide on is life for grazing animals” (Aristotle, 1985, p. 7 cit. in Waterman, 1993). However, he advanced that true happiness is originated in the expression of virtue (Waterman, 1993).

Numbers of thinkers from both East and West have followed Aristotle’s position depreciating hedonic view of life. Finally, they debated happiness by itself cannot be a principal criterion of well-being. Eudemonic principles retain that not all appetites would produce well-being when attained. Even though they are pleasure producing, some outcomes are not good for people and would not promote well-ness. Thus, from eudemonic perspective, subjective happiness should not be compared with well-being.

Waterman (1993) investigating eudaemonist viewpoint, shored to the study of experiences of *personal expressiveness* that is a state in which subjects feel deeply alive and authentic, living as who they truly are. For a long time optimal psychological functioning was a concern of personality psychology.

Nevertheless, he notes that different authors approached this concept with other constructs linked to various theories such as: a sense of personal identity (ego analytic theory, Erikson, 1963), self-actualization (humanistic theory, Maslow, 1968, 1970), internal locus of control (social learning theory, Rotter, 1966), principled moral reasoning (cognitive developmental theory, Gillian, 1982; Kolberg, 1969). An analysis of these constructs led Waterman to underlie that they share the concept of self-realization. Moreover, he empirically found that the two conceptions of happiness are correlated but discernible and that personal expressiveness but not hedonic enjoyment is an indicator of success in the process of self-realization, consequently, of optimal psychological functioning.

Finally, accordingly to Aristotle's view of well-being, other researchers, Ryff and Singer (1998; 2000), define well-being as the struggling for perfection. It represents of the individual's real potential and not merely the achievement of pleasure. Their investigation of the question relating to well-being aimed to develop an existence theory of human flourishing. Ryff and Keyes (1995) showed a multidimensional approach to the measurement of psychological well-being that consists of six distinct elements of human actualization: autonomy, personal growth, self-acceptance, life purpose, mastery, and positive relatedness.

## **1.2 Subjective Well-Being and Psychological Well-Being**

Subjective Well Being (SWB) and Psychological Well-Being (PWB) are two overlapping but moderately distinct traditions of research resulted from the two broad Hedonic and Eudemonic perspectives (Deci and Ryan, 2001). Current study of well-being is characterized by these two streams of empirical investigation. Together they symbolize humanistic principles that raise the

human capability to inspect what provides a good life (Keyes, Ryff and Shmotkin, 2002).

Most research within the new Hedonic psychology has used evaluation of Subjective Well-Being. In agreement with Keyes and colleagues (2002), Subjective Well-Being arose in the late 1950s, a time characterized by concern about subjectivity and increasing interest in the measurement of quality of life. There was a growing interest in the investigation of valuable indicators of life quality in order to screen social transformation and progress in social policy (Land, 1975). Andrews and Withey (1976) and Campbell, Converse and Rodgers (1976) attributed importance to SBW as a significant index of individuals' life quality. They clarified that, although subjects live in objective settings, they respond to them with their subjectively described worlds. Authoritative researchers such as Bradburn (1969), Cantril (1965), Gurin, Veroff and Feld (1960) highlighted life satisfaction and happiness as elements of life quality. Life satisfaction indicates subjects' perception of the distance from their ambitions (Campbell et al., 1976). Happiness derived from a balance between negative affect and positive affect (Bradburn, 1969). Numerous studies have constantly verified the three dimensional structure of life satisfaction, positive affect and negative affect (Lucas, Diener and Suh, 1996). Hence, SWB comprises three elements: life satisfaction, the absence of negative affect, and the presence of positive affect. This combination often provides happiness (Deci and Ryan, 2001). It should be noted that the suspected independence of positive and negative affect has been investigated and significant evidence suggests their separation inside SWB and within the broad spectrum of emotions (Cacioppo, Gardner and Berntson, 1999; Diener, Smith and Fujita, 1995; Keyes, 2000). Moreover, the degree to which measures of SBW effectively delineate psychological well-being has been widely debated (e.g. Ryff and Singer, 1998). Three

views have been derived from a question regarding the hedonic position in research on well-being: are SBW and its measures operational definitions of hedonism or well-being? The first view agrees with the hedonic perspective thus it considers SWB as its operational definition. With regard to the second view, although it agrees with the use of SWB as an operational definition of well-being, it supports the eudemonic perspective of what promotes SWB. Lastly, the third view refuses both hedonic ideologies as the mean to provide well-being and the measures of SWB as definitions of well-ness. Nevertheless, during 1980s and 1990s, SWB has been used as the main indicator of wellness and has been employed in several researches as a major outcome variable (Deci and Ryan, 2001).

On the other hand, according to Keyes and colleagues (2002), Psychological Well-Being research stream (differently from Subjective Well-Being research stream that describes well-being in terms of overall life satisfaction and happiness) refers to well-being in terms of human growth and experience of existential challenges in life. Although its empirical investigation started only in the 1980s, PWB tradition originated from a broad literature provided in the 1950s and 1960s. In those years, numerous studies were concentrated on transformations in optimal degree of essential challenges in life. Additionally, clinical and adult developmental psychology theories exposed constructs such as self-realization and meaningful life. For instance, Erikson (1959) and Neugarten (1973) showed tasks arranged by age-grade and the way with which they are productively dealt. Self-actualization (Maslow, 1968), full functioning (Rogers, 1961), maturity (Allport, 1961) and individuation (Jung, 1933) constructs have been built by psychologists involved in the human growth and development. Jahoda's (1958) criteria of positive mental health derived from several of these theories to suggest an illustration of who is mentally healthy.

The lack of valid and reliable assessment tools may provide an explanation of why these earlier constructs of positive functioning had solely a modest impact on empirical investigation of well-being. Ryff (1989a), starting from convergences in the previous literature, proposed a multifactor approach to PWB. Six psychological dimensions of challenges thriving were distilled. PWB dimensions are referred to diverse challenges with which subjects strive to function in a positive way (Ryff, 1989a; Ryff and Keyes, 1995). The six dimensions are: Self-Acceptance, striving to feel good about oneself nevertheless the awareness of own limits; Positive Relation with Others, searching to increase and preserve trustful and warm interpersonal relationships; Environmental Mastery, pursuing own environment dealing with own personal requirements and appetites; Autonomy, supporting individuality also in a wide social circumstances and searching a perception of individual authority and self-determination; Purpose in Life, pursuing meaning in own efforts and challenges; Personal Growth, exploiting own talents and potential to achieve the most in life.

It should be underlined that components of PWB such as purpose in life and personal growth but not others (e.g. self-acceptance and positive relations with others) embody the self-fulfilment meanings of eudemonic well-being as well as SWB researcher have repetitively comprised not solely affective indices of happiness (hedonic well-being) but also cognitive evaluation of satisfaction in life.

Ryff and Singer (1998) and Diener and colleagues (1998) have debated around these two traditions of researches. The first authors argued that SWB view of wellness is incomplete when positive functioning is approached; hence, SBW is often a weak index of health life. In contrast, Diener and colleagues (1998) stated that SWB research permits subjects to express to scientists what causes their life good, while Ryff and Singer's eudemonic

measures produce a definition of well-being provided solely by experts. Consequently, diverse definitions of well-being have led to relatively dissimilar kinds of investigation regarding causes, consequences and dynamics of wellness. However, according to Deci and Ryan (2001), those evidences suggest that well-being is possibly best comprehended as a multidimensional state comprising elements of together the hedonic and eudemonic principles regarding well-being. For instance, an investigation of the association amongst eighteen indicators of well-being identified two factors reflecting SWB and personal growth and a moderate association between them (Compton et al., 1996). Ryff and Keyes analysing the correlation between PWB and SWB found a moderate correlation between Environmental Mastery and Self-Acceptance and measures of happiness and life satisfaction, while Autonomy, Positive Relationship with Others, Personal Growth and Purpose in Life presented mixed of weak associations to SBW.

This finding suggests that hedonic and eudemonic inquiries are at the same time intersecting and distinct, thus an assessment of well-being in different ways may lead to a superior appreciation of this concept.

### **1.2.1 Sociodemographic and personality variables in SWB and PWB streams**

Traditionally, the relationship between SWB and PWB and personality and socio-demographic variables has been studied separately and numerous findings have been reported (Keyes et al., 2002).

A broad review of studies provided that personality, although it was demonstrated being a potent predictor of SWB, explained only a little amount of variance of SWB and its related

reactivity to psychological processes and experiences of life (De Neve and Cooper, 1998).

Distinct connections between neuroticism and negative affect and extraversion and positive affect have been established by Costa and McCrae (1980) and confirmed in later investigations (e.g. Watson and Clark). Additionally, SWB can be instrumentally conditioned by Conscientiousness and Agreeableness in terms of creating circumstances, behaviours and life events that simplify or moderate SWB. Lastly, a possible explanation of the weakest correlation that has been found between Openness to Experience and SWB may be that this personality dimension induces either negative or positive affect (e.g. McCrae and Costa, 1991).

Moreover, personality has been found significantly associated with PWB components. For instance, multiple elements of well-being, principally Self-Acceptance, Environmental Mastery and Purpose in Life resulted consistently predicted by Neuroticism, Extraversion and Conscientiousness (Schutte and Ryff, 1997). Additionally, Openness to Experience (in addition to Extraversion) appeared as a high predictor of the Personal Growth component while Agreeableness predicted positive association with others. Although various traits predicted Autonomy, the strongest correlation was found with Neuroticism.

With regard to socio-demographic variables, numerous studies have conducted in both SBW and PWB stream of researchers.

Inquires in social gerontology around SWB constructs showed that aging was not as homogeneously correlated with deteriorations of SWB as anticipated. Positive affect shows evidence of both deterioration and improvement with age, negative affect seems to persist for some and worse for others, while life satisfaction may even improve (e.g. Charles, Reynolds

and Gatz, 2001). These results may be explained in terms of different approaches to adaptation to aging (Shmotkin, 1998).

Regarding PWB, several studies have shown the effect of socio-demographic variability in terms of age, gender and education (e.g. Clark, Marshall, Ryff and Rosenthal, 2000). Moreover, important transitions and experiences in life, for example, community relocation (e.g. Kling, Ryff and Essex, 1997), parenthood (Ryff, Schmutte and Lee, 1996), and health transformation of later life (Heidrich and Ryff, 1993) have been interrelated to PWB.

Traditionally, the influence of socio-demographic and personality characteristics has been studied separately by the two well-being streams of inquiry. Nevertheless, research is dedicating to the combinations of SWB and PWB.

For instance, Keyes and colleagues (2002), studying these traditions together, suggested that the combination of them may relate differently to socio-demographic and personality variables. Their findings suggested a typological model based on a cross-classification of different levels of SWB and PWB consisting of on-diagonal and off-diagonal types. While the first refers to subjects with significant levels (high or low) in both SWB and PWB, the second relates to subjects with high levels of SWB and low levels of PWB or the opposite. Hence, it was shown that SWB and PWB do not only contain overlapping distributions but also lead to distinct forms of well-being. They found that different combinations of well-being are connected to age and educational standing. Subjects who present low level of both SWB and PWB are incline to be younger adults with less education. Subjects with high level of PWB and low level in SWB tend to have higher education than those have low level in both of them. Instead, subjects with high SWB but low PWB tend to be midlife and older adults and have less education. Lastly, midlife and older

adults with higher education tend to have high level in both SWB and PWB. Thus, optimal well-being is evidently linked to age and education.

Combinations of well-being and personality traits were found in both on-diagonal and off-diagonal types of well-being. It was found that Neuroticism, Extraversion and Conscientiousness significantly differentiated subjects who were high or low in both SWB and PWB. The first showed the strongest discrimination ability. It should be noted that the role of Conscientiousness as a strong predictor of SWB and PWB was overlooked by previous research.

With regard to the off-diagonal type a moderate correlation between high Neuroticism and high Conscientiousness and high PWB and low SBW combination was found. Differing as expected, Agreeableness did not differentiate between subjects with discordant combinations of SWB and PWB. Lastly, a finding that denotes a new input to research on personality and well-being was established: subjects with high levels of PWB and low levels of SWB were discriminated from those with high SWB and low PWB by their high levels of Openness to Experience. This finding certainly denotes a new input to research on personality and well-being.

In addition, this model suggests that SWB and PWB in the on-diagonal types can complement each other. For instance, when there are equivalent levels, SWB and PWB may complement each other by producing a sense of self-congruency.

On the other hand, SWB and PWB in the off-diagonal types can compensate for each other. For instance, higher SWB can conserve positive affect when there are low levels of PWB because of absence of opportunity. Otherwise, the high requests to achievement the most of own potential can destabilise SWB however enhancement PWB.

### 1.3. Hedonic and Eudemonic streams. A reformulation

Accordingly to Keyes and colleagues (2008), subjective well-being is erroneously compared with hedonic happiness through measures of positive emotions and life satisfaction (e.g. Kahneman, Diener and Schwartz, 1999). Subjective well-being is the subjective evaluation around life quality in terms of experiences, achievements, relationships, and other culturally important ways of functioning in life and comprises two compatible streams: Hedonic and Eudemonic traditions which emphasizes *positive emotions* and *positive functioning*, respectively.

The Hedonic stream associates mental health with avowed quality of life and the experience of positive emotions, embodying human interests to both exploiting the quantity or extent of pleasant states and diminishing the quantity or extent of unpleasant states.

These constructs have different temporal structures. While happiness, as a reflection of enjoyable and not enjoyable affects, is referred to instantaneous experience, life satisfaction is a judgmental and long-term rated component.

The Hedonic tradition is reproduced in the stream of inquiry on Emotional Well-Being (EWB) which involves perception of positive affect and avowed quality of life. The first indicates “regularly cheerful, interested in life, in good spirits, happy, calm and peaceful, full of life” instead the second regards “mostly or highly satisfied with life overall or in domains in life” (cit. in Keyes 2005b).

On the other hand, the Eudemonia stream associates mental health with human potential whose accomplishment induces positive functioning in life. This tradition has been rated as Psychological Well-Being (PWB) (Ryff, 1989) and Social Well-Being (SWB) (Keyes, 1998). Ryff’s (1989; Ryff and Keyes,

1995) multidimensional model embraces six dimensions of PWB (Self-acceptance, Personal Growth, Purpose in Life, Positive relations with Others, Autonomy and Environmental Mastery), which indicate the challenges that subjects meet when they strive to actualize their aptitudes. Keyes's (1998) multidimensional model of SWB comprises five dimensions which specify whether and to what extent subjects are socially functioning. They are: *Social Integration*, "holds positive attitudes toward, acknowledges and is accepting of human differences"; *Social Contribution*, "believes people, groups and society have potential and can evolve or grow positively"; *Social Coherence*, "sees own daily activities as useful to and valued by society and others"; *Social Actualization*, "interested in society and social life and finds them meaningful and somewhat intelligible"; *Social Acceptance*, "a sense of belonging to, and comfort and support from, a community" (cit. in Keyes, 2005b). The central difference between psychological and social functioning regards how subjects observe themselves functioning as "I" or "Me" and "We" and "Us", respectively.

Each of these measures of subjective well-being is considered a "symptom" or "characteristic" of mental health representing indicators of an otherwise unobservable human condition. Keyes proposed a diagnosis of the mental health continuum, underlying the fact that although does not exist a specific diagnosis tool for mental health, over the time, research on subjective well-being unintentionally provided "clusters of mental health symptoms that mirror the cluster of symptoms used in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000) to diagnose MDE. In the same way that depression requires symptoms of an-hedonia, mental health consists of symptoms of hedonia such as emotional vitality and positive feelings toward one's life. In the same way that major depression consists of mal-functioning mental health

consists of symptoms of positive functioning” (Keyes, 2007, p.98). Two terms “*Flourishing*” and “*Languishing*” were proposed to describe and provide a diagnosis of the continuum of mental health. Flourishing in life is diagnosed when subjects show high levels on at least one measure of hedonic well-being and one of the six measures of positive functioning. Individuals with flourishing in life “have enthusiasm for life and are actively and productively engaged with others and in social institution” (Keyes, 2002a, p.262). Languishing in life is a state in which subjects feel their own life empty, “a life of quiet despair” (Keyes, 2002b, p. 210), although mental illness is not shown. They present low levels on at least one measure of hedonic well-being and one of the six measures of positive functioning. In the mid of the continuum there is individuals who are *moderately mentally healthy*. They do not fit the criteria for the previous levels. *Completely mentally healthy* is referred to subjects free of a twelve-month mental disorder and flourishing.

Keyes suggests the use of both categorical and continuous assessment, in fact, all items of mental health are summed into a total score, which is then coded into a range of five points after the Global Assessment of Functioning approach in the DSM-IV.

Flourishing and moderately mentally healthy individuals may present mental disorders or their comorbidity. Mental illness may be present in flourishing people or, otherwise may be absent in moderately mentally healthy individuals or in individuals in languishing conditions. Complete mental health is a condition in which subjects are flourishing and without mental illness in the same time. Keyes argues that function of an individual who has not a mental illness but is languishing is worse than that of an individual who presents both a mental illness and flourishing or moderate mental health.

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## CHAPTER 2: MENTAL WELL-BEING AND MENTAL ILL-BEING

An important topic is provided by the increasing interest in positive mental health. It refers to whether mental well-being lays in the same continuum with mental ill-being or they are independent dimensions. The first position, where mental well-being and mental ill-being are opposite ends of a bipolar continuum, suggests that who has low levels of mental well-being shows high level of mental ill-being and what we have learnt until now about psychological disorder is also decisive for positive mental health. In contrast, the other view supports the hypothesis that mental well-being and mental ill-being reflect two distinct latent factors (Ryff et al., 2006).

Researchers that support the latter view started focusing on positive and negative affect. It was provided that the two kinds of affect are widely independent and the association between them is slightly strong (Ryff et al., 2006). For instance, Watson, Clark and Carey (1988) showed that while positive affect is negatively correlated with depression measures, it is not correlated with anxiety measures. Furthermore, causes and consequences of well-being may be different to mental ill-being in the case that the hypothesis of independence between mental-illness and mental well-being is assumed.

Other “possible explanations for these findings include issues relating to how psychiatric conditions are defined, the fluctuating nature of mental illness, and individuals interpretations and responses to positively and negatively worded items on mental health measurement scales ” (Stewart-Brown and Janmohamed, 2008, p. 2).

## 2.1 Bipolarity versus Independence models

Corey L. M. Keyes is one of the most influential researchers who investigated the relationship between mental wellness and mental illness. Although the methodological limitations that, undoubtedly, belong to a cross-sectional study, the author provides attractive data from MacArthur Foundation's Midlife in the United States (MIDUS) study (Brim, Ryff and Kessler, 2004). Keyes (2007) tested the two opposed theories translating them in psychometric terms: do measures of mental ill-being and measures of mental well-being belong to a single latent factor or represent two distinct factors?

A confirmatory factor analysis was run on data collected from a large U.S sample to which was administered MIDUS measures. They consisted of three scales covering mental health construct (emotional well-being, EWB; psychological well-being, PWB; social well-being, SWB) and four scales measuring a number of symptoms of Major Depressive Episode (MDE), panic disorder, generalized anxiety disorder, and alcohol dependence. Psychometric analyses rejected the hypothesis of a single factor model (mental-illness measures and well-being measures reflect the same latent factor) and supported the hypothesis of a two factors model. The latent dimension of mental health reflected by measures of well-being results distinct from, but correlated with, the latent dimension of mental illness provided by measures of mental illness. Essentially, an improvement of mental health exists when mental illness symptoms decrease, but this relationship is modest (correlation between mental illness latent factor and mental health latent factor is only -0.53). Hence, "the absence of mental illness is not the presence of mental health" (cit. in Keyes, 2007). This is supported by the evidence that only a little proportion of general population without mental disorders is mentally healthy. Solely 17% of adults in U.S.A are flourishing (Keyes, 2007). A Scottish survey, using the Warwick-Edinburgh

Mental Well-Being Scale (WEMWBS, Tennant et al., 2007), found that only 14% of the population have a “good mental well-being” (Braunholtz et al., 2007). The “North West Mental Well-Being survey 2009”, using the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS, Stewart-Brown et al., 2009), found that 20,4 % of the population in the North West region in England show a “High wellbeing” (Deacon et al., 2010).

In the case that mental health belongs to a continuum that is separate from the continuum of mental illness, consequently the absence of mental illness is not the presence of mental health, the exclusive care of mental disorders is not sufficient to promote mental health in the general population and the percentages showed above are proofs of that.

Keyes (2007) suggested that the current mental health approach in U.S.A is focused only on reducing mental illness and it does not correspond to the promotion of mental health as flourishing. He stated that this vision of health, in which prevention and treatment of mental illness are supposed to lead to mentally healthier population, finds its roots in a surpassed era. Keyes argued that three conceptions of health resulted from three different approaches to health followed one another in the human history. The first was the “pathogenic approach” derived from the Greek word “pathos” and referred to health as the lack of disease and disability. The second is the “salutogenic approach” derived from the word “*salus*”. It was the interest of study for Anthonovsky (1979) and humanistic scholarship (e.g., Carls Rogers and Abraham Maslow). Health is a consequence of positive states of human capabilities in behaviour, feeling and thinking (Strumpfer, 1995). The last one is the “complete state model approach” derived from the word “*hale*”, the meaning of which was well explained by the World Health Organization (1948). It referred to health with the following terms: “a state of complete physical, mental and social well-being and not merely

the absence of disease”. Hence, mental health is a complete state including mental illness continuum and mental health continuum.

Keyes claims that United States and other industrialized countries operated an epidemiological transition from an era where infections were the first reason of premature death an era, in our time, where life expectancy is increased and, as consequence, “the number of years spent living with chronic physical diseases and mental disorders rather than greater health”. Before the epidemiological transition, prevention and treatment of diseases as approach to guarantee health was a winner strategy thanks to that life expectancy was increased. It has demonstrated being expensive and ineffective in this age (Keyes, 2007).

## **2.2 Principal predictors of well-being**

In a recent review on causes and consequences of psychological well-being (Huppert, 2009) are displayed numerous evidences, which suggest that the principal predictors (or “drivers”) of well-being are not in each case the same of those of ill-being. Some drivers are similar, others are different.

Disparity effects for well-being and ill-being are related to demographic factors.

With regard to age, it is shown a U-shaped relationship with age when are used single-item measures such as the life satisfaction scale (e.g. Clark and Oswald, 1994). It means that the middle-aged adults incline to provide lower well-being scores than younger and older subjects, whereas scores tend to decrease in the very elderly. Singleton, Bumpstead, O’Brien, Lee and Meltzer (2001) indicated that the middle-aged showed also the greatest prevalence of common mental disorders. When well-being is investigated using more sophisticated measures, the association between age and mental well-being becomes less

immediate. Scores of “Autonomy” and “Environmental mastery”, two subscales of the Ryff’s tool tend to increase with progressing age (Ryff and Singer, 1998b) as well as scores of measures such as sense of coherence (Stephens et al., 1999).

Furthermore, even the association between mental well-being and gender is complex. There were little evidences of gender differences (e.g. Helliwell, 2003), although some studies presented higher scores for men (e.g. Stephens, Dulberg and Joubert, 1999) while others reported higher scores for women on sub-scales such as those assessing social functioning (e.g. Huppert, Walters, Day and Elliot, 1989). This is in contrast with evidence derived from ill-being measures where women present more symptoms of mental disorders (such as anxiety and depression) than men.

Great attention has been paid to the relationship between ill-being, well-being and personality, particularly to extraversion and neuroticism dimensions. Numerous researches have focused on the relationship between these two dimensions and emotional style. Several cross-sectional studies established that neuroticism is correlated with a negative emotional style whilst extraversion is worthy correlated with a positive emotional style (e.g. Diener, Suh, Lucas and Smith, 1999). Although the findings related to mental illness were supported also by longitudinal studies (e.g. Kendler, Gatz, Gardener and Pedersen, 2006) which found a link between younger ages and psychological distress in adults, it was not found a causal correlation between mental ill-being and extraversion (e.g. Neeleman, Ormel and Bijl, 2001). On the other hand, other studies paid further attention on the relationship between extraversion/ neuroticism and psychological function, referring to Ryff theory of psychological well-being. Although cross-sectional studies (e.g. Vitterso and Nilsen, 2002) found robust correlations between extraversion/neuroticism and psychological well-being, Abbott et al. (2008) in a longitudinal

study found a stronger effect of extraversion than neuroticism on psychological well-being than neuroticism on psychological well-being.

Marital status has been frequently correlated with superior life satisfaction and inferior degrees of mental illness (Donald, Peasgood and White, 2008). However, certain longitudinal studies (e.g. Zimmermann and Easterlin, 2006) have found that whereas “getting married” was associated with psychological well-being, “being married” might not be. Moreover, Lindfors, Berntsson and Lundberg (2006) indicated that autonomy (a psychological well-being dimension) is higher in separated or divorced women compared to women who are married or who are not ever married.

On the other hand, socio economic factors show similar effects on both well-being and ill being. Generally, greater socioeconomic status and levels of income are correlated with lower degrees of mental-illness and higher degrees of mental well-being. Income inequality was also investigated. Greater national income inequality is associated to inferior scores on well-being measures (e.g. Alesina, Di Tella and MacCulloch, 2004) and prevalence of superior mental illness. A more composite picture arises where variables correlated with socioeconomic factors, such as educational qualification and unemployment, are observed. A little amount of research (e.g. Dolan et al., 2008) found that higher educational qualifications not necessary protect mental health; in contrast several studies indicated the opposite. For instance, men with a higher level of education were more likely to get depressed than others with lower level of education. This finding was found by Chevalier and Feinstein (2006), who provided an interpretation based on the stress related to job demanding a degree or increasing of expectations, which may not have been satisfied. Lastly, both lower levels of life satisfaction (e.g., Winkelmann and Winkelmann, 1998) and the presence of mental ill-ness (e.g., Evans and Repper, 2000) were, for long

time, correlated with unemployment. This relationship appears influenced by contextual factors. Lower impact of unemployment was exhibited by individuals who live in zones where unemployment is high (e.g., Shield and Wheatley Price, 2005). Huppert and Whittington (2003) underlay the need of a more refined approach to investigating the effect of unemployment. They found that, analysing separately the responses to items referred to positive mood and function and those to items referred to symptoms, unemployment was more intensely linked with the absence of positive well-being than with the presence of symptoms of psychological distress. This is a relevant finding: unemployment individuals tend to have not flourishing in their life, rather to have mental disorders such as depression or anxiety.

### **2.3 Promoting Mental health**

Flourishing as the principal element of complete mental health is what any government and community aspire to promote and to protect in its population. Evidences suggest that completely mentally healthy individuals miss fewer workdays, present fewer chronic diseases and lower care utilization than all others. Furthermore, individuals with languish in life have been shown to be at large risk of developing depression disorders and physical diseases (e.g., cardiovascular diseases). Health care policies need to surpass the view in which mental health is promoted by the sole reduction of mental illness to shift toward the “complete state model approach” of health whose aim should be to promote flourishing in subjects without mental illness but not mentally healthy as well as prevent and treat cases of mental disorders (Keyes, 2007).

Huppert (2009) discusses that positive affect as well as the absence of it may provide stronger leverage on health and physiology than negative affect or the absence of it.

Several researches suggest a direct influence on biological functions (e.g. hormonal and immune systems) provided by positive mental conditions, which, in turn, impacts on physical health. For example, Lai and colleagues (2005) studied the influence of positive psychological conditions on neuroendocrine regulation investigating the impact of optimism and positive affect on salivary cortisol. Their findings suggest that positive psychological characteristics, including optimism and generalized positive affect, had higher impact on cortisol secretion than negative affect and pessimism.

With regard to the relationship between positive emotions and immune system, for instance, Cohen and colleagues (2003a), administering nasal drops inclosing a cold virus to healthy subjects, established that who showed a positive emotional style had being presented inferior risk of emerging a cold, whilst, relationship between negative emotional style and developing a cold was not found. Davidson and colleagues (2003), some months after a preliminary mindfulness meditation intervention (which grows a positive mental state) and a subsequent influenza vaccine, found a considerably superior antibody response in the treatment group than in the control group. Thus, as stated Pressman and Cohen (2006), evidences suggest not solely the advantageous effects of positive emotions on physical health and survival, but also their independence from the level of negative emotion.

It should be noted that the relevance of these findings is unnoticed, because of the predominant research focused on pathology (belonging to biomedical science domain), which uses measures that operate a separation between the presence of negative states and the absence of positive states.

Huppert (2009) also argues that the promotion of flourishing in the population may obtain more decrease of mental illness and

behaviour problems than interventions focused solely on prevention and treatment of mental disorders. Although epidemiologists suggest that the sole practice of prevention and treatment of mental illness will provide always new cases of mental disorders playing a role in the short term, the exclusively intervention on subjects with mental disorders is still the focus of current mental care. However, there is a need to intervene at the general population level to decrease mental illness in the long term. Additionally, the awareness that well-being is more than the lack of mental-illness provides the reason for investigating well-being and the need to differentiate among strategies to reach psychological well-being in the population: to prevent disorders, to treat them when occur and improve well-being (leading individuals to flourishing in life). There is the need to spend more attention on mental states, which have a large impact on health and life expectancy, such as dysphoria, absence of enjoyment in life (Huppert and Whittington, 2003), or “languisher” in Keyes’ terms. Furthermore, recent studies show that drivers of mental well-being are not always the same of those of mental illness (see paragraph 2.2).

There is also the need to shift from observational studies to intervention studies in order to verify whether both a decrease of mental health disorders and an increase of flourishing in individuals correspond to an improvement in the population well-being derived from interventions at the population level. It is certainly justified by the growing attention of the public health perspective to the importance of positive mental health at population level, in terms of social and economic prosperity. For instance, the World Health Organization Mental Health Declaration and Action Plan for Europe affirm that “Mental health and well-being are fundamental to quality of life, enabling people to experience life as meaningful and to be creative and active citizens. Mental health is an essential component of social

cohesion, productivity and peace and stability in living environment, contributing to social capital and economic development in societies” (WHO, 2005a).

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## **CHAPTER 3: WELL-BEING MEASURES**

### **The Satisfaction With Life Scale (SWLS)**

The Satisfaction With Life Scale (SWLS, Diener et al., 1985) is one of the most extensively used tools to measure well-being (Diener et al., 1999). It was developed to assess satisfaction with the participants' life as a whole. The scale consists of 5 items and its scoring involves assigning a value of 1 to designate strong disagreement with a statement up to a value of 7 to indicate a strong agreement with a statement. The instrument does not refer to satisfaction respect a specific domain of life, but consider participants have their own subjective ways to value satisfaction in their lives (Pavot and Diener, 1993). The scale has strong internal consistency (alpha coefficient of 0.87) and good temporal stability (test-retest reliability at two months of 0.82) (Diener et al., 1985). Good construct and discriminant validity were proved as well (Pavot and Diener, 1993).

### **The Scale of Psychological Well-Being (SPWB)**

The Scale of Psychological Well-Being (SPWB, Ryff, 1989) is a self-report instrument based on six dimensions covering different aspects of positive psychological functioning. It consists of six scales and each scale includes 20 items equally split between positive and negative items. The six scales refer to six dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life and personal growth. Scoring consists of 6-point scale ranging from strongly agree to strongly disagree. It shows a strong internal consistency (alpha coefficient range from 0.87 to 0.90) (Schmutte and Ryff, 1997). According to Kafka and Kozma (2001), the SPWB was found to correlate negatively with measures of depression such as

the Zung's Depression Scale (Zung, 1965) and positively with the Life Satisfaction Index (Neugarten et al., 1961) and the Affect Balance Scale (Bradburn, 1969).

### **The Positive and Negative Affective Schedule (PANAS)**

The Positive and Negative Affective Schedule (PANAS, Watson et al., 1988) comprises two subscales, one measuring positive affect (10-item PANAS-PA) and the other measuring negative affect (10-item PANAS-NA). Each item is rated on a 5-point scale, 1 = very slightly or not at all, 2 = a little, 3 = moderately, 4 = quite a bit and 5 = very much, to indicate the extent to which the respondent has felt this way in the indicated time frame. The authors have used the scale to measure affect at this moment, today, the past few days, the past week, the past few weeks, the past year, and generally (on average). It has been found to be a reliable and valid measure of these two distinct dimensions of affective structure (Watson et al., 1988).

### **The Depression-Happiness Scale (DHS)**

The Depression-Happiness Scale (DHS, McGreal and Joseph, 1993) is a self-report scale aimed to measure depression and happiness. It comprises 25 bipolar items: 12 items concerned with positive thoughts and feelings and 13 items concerning negative thoughts and feelings. Respondents are asked to think about how they have felt in the past 7 days and to rate the frequency of each item on a 4-point scale: 0 = never, rarely = 1, sometimes = 2, and often = 3. Items regarding negative thoughts, feelings, and bodily experiences are reverse-scored thus the score can range from 0 to 75, with higher scores representing greater frequency of positive thoughts and feelings and lower frequency of negative thoughts and feelings (Joseph and Lewis, 1998). Hence, a total index of

happiness is yielded. The psychometric properties of the DHS have been shown to be satisfactory (e.g. Cammock, Joseph and Lewis, 1994). A cut-off point of 42 was proposed to identify mild but clinically relevant depression, approximate to a score of 10 on the BDI (Lewis, Joseph and Shevlin, 1999).

The purpose of the DHS is providing a continuous measure of the depression–happiness continuum. The DHS is useful for health workers employed in a positive psychological context where, beyond the alleviation of depression, there is also the concern around the promotion of happiness. A shorter version of the DHS was developed by Joseph and colleagues (2004).

### **The WHO-5**

The Well-being Index WHO-5 (Bech, 2004) is a psychometrically sound short scale for measuring emotional well-being. It consists of five positively worded items: “I have felt cheerful and in good spirits;” “I have felt calm and relaxed;” “I have felt active and vigorous;” “I woke up feeling fresh and rested;” and “My daily life has been filled with things that interest me.” Respondents are asked to provide their degree to which the above-mentioned feelings were present in the last 2 weeks with a 6-point Likert scale ranging from 0 (not present) to 5 (constantly present). The sum score of the WHO-5 ranges from 0 to 25; a score below 13 indicates poor well-being and represents an indication for testing for depression (World Health Organization, 1998). The WHO-5 has proved a good screening instrument for the detection of depression in the general population (Henkel et al, 2003; Loewe et al, 2004).

### **The MHC-SF**

The Mental Health Continuum is a well-being measure based on the clinical approach to the continuous assessment and categorical diagnosis of positive mental health as not the merely lack of mental illness (see above paragraph 1.3). There are two versions, a long form version (Keyes, 2005a) validated in a national sample of US adults aged from 25 to 74 years and a short-form version (MHC-SF, Keyes, 2005b) validated in a random sample of adults from the northwest of South Africa aged from 30 to above 80 years.

The MHC-SF comprises 14 items. The first three items are related to EWB (Emotional Well-Being), defined as positive affect and satisfaction with life. Other 5 items refer to the five facets of SWB (Subjective Well-Being, Keyes, 1998): social acceptance, social actualization, social contribution, social coherence, social- integration. The last 6 items relate to the six dimensions of PWB (Psychological Well-Being) as defined in Ryff ' s (1989) model: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance.

### **The BBC Wellbeing scale**

The BBC wellbeing scale (Kinderman et al., 2011) is a new measure recommended for research and clinical purpose. It consists of 24 items scored with a 4-point scale, and covering three factors: psychological wellbeing, physical health and wellbeing, and relationships. It shows good psychometric properties in terms of internal consistency, construct and criterion validity. Kinderman and colleagues (2011) argued that their purpose was to develop a general measure of wellbeing. Till date, measures address specific aspects of wellbeing rather than

assessing the integrative view of the construct. The Diner's Satisfaction With Life Scale (Diener et al., 1985) measures attitudes assumed by the authors rather than the experience lived by the respondents. WHOQOL-100 (WHOQOL Group, 1998), WHOQOL-BREF (WHOQOL Group, 1998) and the EUROQOL (The EUROQOL group, 1990) are extremely focused on physical health. Authors also underlined that the two established questionnaires, the PWBQ (Ryff, 1989) and the WEMWBS (Tennant et al. 2007), lack relevant focus on physical aspects of well-being. These features are behind the development of this new scale.

### **The PMH instrument**

The Positive Mental Health (PMH, Vaingankar et al., 2011) instrument is a multidimensional 47-items self-administered tool developed and validated in a multi-ethnic Asian population, precisely Singapore. The most relevant reason for its development was that the major part of mental well-being measures were developed and validated within Western populations compromising their appropriateness in others cultures. Specifically, a previous study demonstrated the importance of religious and spiritual aspects in this particular population. These elements are usually ignored by Western researchers as part of the wider concept of positive mental health. Hence, Western tools lack focus on spiritual themes. The PHM instrument is a reliable and valid tool covering six domains of mental health: Personal growth and autonomy, Relationships, Spiritual beliefs and practices, Coping strategies, Personal characteristics, and Global affect. Respondents are asked to select a number showing their degree respect of the description of them with a 6-point scale ranging from 1 = "not at all like me" to 6 = "exactly like me". Differently, the Global affect subscale is scored using a 5-point

scale referring to a list of five affect indicators. A shorter version will be provided by the authors.

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## **CHAPTER 4: THE WARWICK-EDINBURGH MENTAL WELL-BEING SCALE (WEMWBS)**

The Warwick-Edinburgh Mental Well Being Scale (WEMWBS, Tennant, Hill, Fishwick, Platt, Joseph, Weich, Parkinson, Secker and Stewart-Brown, 2007) is a measure of mental well-being covering both eudemonic and hedonic aspects designed to support mental health promotion initiatives.

It was developed by the University of Warwick and the University of Edinburgh, commissioned by NHS Health Scotland and funded by the Scottish Government's National Programme for improving Mental Health and Wellbeing.

It consists of 14 positive worded items, which assess positive affects (feeling of optimism, relaxation, and cheerfulness), satisfying interpersonal relationships and positive functioning (energy, clear thinking, self-acceptance, personal development, competence, and autonomy) in the general population. Scoring consists of 5-point Likert scale (1 =none of the time, 2 = rarely, 3 = some of the time, 4 = often, 5 = all of the time) yielding a total score of 14-70, with all items scored positively. Individuals are asked to tick the box that best describes their experience of each over the last 2 weeks and a high score corresponds to a high level of mental-well-being (Tennant et al., 2007). It is easy to administer and focuses only on positive aspects of mental health.

The start point of the development of the scale was the Affectometer 2, a measure of mental well-being developed in New Zealand (Kammann and Flett, 1983) and validated in UK (Tennant et al., 2006). Affectometer 2 showed good face and construct validity, stability and ability to discriminate different population groups; nevertheless, it demonstrated to have very high value of

internal consistency ( $r=0.94$ ) and appeared to be prone to social desirability bias. These elements and its long length were behind the development of the WEMWBS (Tennant et al., 2007).

The new scale was tested in student and population samples aged 16 years and over, whose sizes were almost 350 and more than 2000, respectively. In the first sample, participants were undergraduate and postgraduate students at Warwick and Edinburgh universities whilst with regard to population sample data came from two representative Scottish population datasets, *2006 September wave of the Scottish Health Education Population survey (HEPS)* (NHS Health Scotland, 2007) and *Well? What do you think? Survey* (Braunholtz et al., 2007).

Good psychometric properties were proved. The WEMWBS seems to have good face validity covering the large concept of positive mental health in both directions of Hedonic and Eudemonic perspectives. To test the hypothesis of one-structure of the scale a confirmatory factor analysis was run and results confirmed the one-factor structure.

Reliability coefficients, in terms of internal consistency and stability, were shown to be good. Cronbach's alpha coefficient was 0.89 and 0.91 in students and population samples, respectively. The range of item-to-scale correlations (corrected for overlap) for items were  $r = 0.52-0.80$  in students sample and  $r = 0.51-0.75$  in population sample. Moreover, the students sample completed one week test-retest of the WEMWBS with a correlation of  $r = 0.83$  ( $p < 0.01$ ). It is necessary to assess the scale's test-retest reliability on a population sample and at an interval longer than one week.

To test criterion validity eight other scales were administered to the students' sample. Convergent validity correlations for the four scales covering aspects of well-being were high, providing good support for the convergent validity of

the WEMWBS. Spearman's rank correlation coefficients were  $r = 0.71$  with the PANAS-PA,  $r = 0.74$  with the SPWB;  $r = 0.73$  with the SDHS;  $r = 0.77$ , with the WHO-5; all significant at  $p < 0.01$  level. EQ-5D VAS and EIS showed low to moderate significant correlations ( $r = 0.43$  and  $r = 0.48$ , respectively, both with  $p < 0.01$ ), as the Authors hypothesised. Last two scales measure overall physical health (besides mental health) and emotional intelligence, respectively. WEMWBS showed higher than expected correlations with SWLS and the single item GLS (Eurobarometer Life Satisfaction), two life satisfaction scales. Correlations found between WEMWBS and these scales were  $r = 0.73$  and  $r = 0.53$ , respectively ( $p < 0.01$ ). A moderate negative correlation of  $r = -0.54$  ( $p < 0.01$ ) was found with PANAS-NA. Data collected from the population sample showed moderate negative correlation between WEMWBS and GHQ-12 as it was expected. Correlation coefficient was  $r = -0.53$  ( $p < 0.01$ ).

WEMWBS appears to induce low social desirability bias in individuals, as demonstrated by administering the Balance Inventory of Desirable Response (BDRI, Paulhus and Reid, 1991) in the student sample. Moreover, WEMWBS seems free of ceiling and floor effects in both student and population samples. Although these data proved favourable convergent and divergent validity; they may not generalize to a population level.

In the student sample was found a median score of 50 (interquartile ranges: 45-55) and in the population sample a median of 51 (interquartile ranges: 45-56).

Significant differences across gender, age, socio-economic status, housing tenure, marital status, and employment status were found in the population sample. Significant higher WEMWBS scores were found for men than women, for subjects aged 16-24 or 55-74, for higher socio-economic status, for owner-occupiers,

for widowed or divorced or separated, and for unemployed people.

The high values of internal consistency of the scale suggested its length may be reduced. Stewart-Brown and colleagues (2009), using Rasch analysis, found that a short seven-item version of WEMWBS (SWEMBS) showed robust measurement properties. Though SWEMBS satisfies the strict unidimensionality expectation of the Rasch model, its doubtful validity is the reason for continuing to collect data with the 14-item version of the scale.

Clark and colleagues (2011) validated the WEMWBS in a large population sample of school students aged 13-16 years in England and Scotland, providing further proof of its good psychometric properties.

The original version of WEMWBS has been adapted into Italian, and Spanish and its psychometric properties have been tested also in Northern Ireland.

The Italian validation of the WEMWBS was undertaken in 2011 by Gremigni and Stewart-Brown. The authors argued that the Italian WEMWBS showed good psychometric properties, in terms of reliability and criterion validity. Good internal consistency (Cronbach's alpha of 0.87) and test-retest reliability ( $r = 0.80$ , a week after the first administration) as well as high correlations with other wellbeing measures were found. Additionally, it did not appear prone to social desirability bias ( $r = 0.15$ ). Confirmatory factor analysis supported the hypothesis of a single factor structure, but it was suggested to delete two items from the scale. It was concluded that the Italian version of the WEMWBS suits the evaluation of mental health perception at a general population level.

Lopez and colleagues (2012) adapted the WEMWBS into Spanish and preliminary tested its psychometric properties in a student sample ( $n = 150$ ). They chose to use the WEMWBS to assess the mental well-being at the general population level in Catalonia (Spain) as part of a National Health Survey. Solely 4 items were modified because they were not conceptually and linguistically comparable to the original UK version.

Replicating the validation process of the original scale, they found high internal consistency (Cronbach's alpha  $r = 0.90$  and item total correlations  $r = 0.44-0.76$ ), good test-retest reliability ( $r = 0.84$ ), and similar construct validity. The last was tested using 6 of the scales that had been used in the original validation study and referred to four concepts associated to mental well-being: PANAS-PA, PANAS-NA, WHO-5 (covering positive and negative affect), SWLS, GLS (regarding life satisfaction) and EQ-5D-VAS (measuring overall physical health). Results of Spearman correlations were similar to those found in the original study, except for the correlation with SWLS ( $r = 0.57$ ;  $p < 0.01$ ). Moreover, the hypothesis of a single factor structure was not supported by Confirmatory Factor Analyses and a considerable ceiling effect was found. A limit of this study was the high percentage of female participants (75%). Although the Spanish version of the WEMWBS needs to be validated in a larger and more varied population, it seems to be a useful tool for monitoring well-being in Spain.

Lloyd and colleagues (2012) studied the psychometric properties of the WEMWBS in a large sample of Northern Ireland, a UK region that might be expected to diverge in well-being because of its difficult history of civil conflict. It was found a high internal consistency (Cronbach's alpha  $r = 0.93$ ). Criterion validity was tested considering only the GHQ12 and a statistically significant correlation between the two questionnaires was found. Exploratory Factor Analysis supported a one-factor solution,

although it was weakly supported by Confirmatory Factor Analysis, in line with Tennant and colleagues (2007) findings. Despite these limitations, the validation of the WEMWBS in Northern Ireland was proved.

Lastly, a limitation of the WEMWBS may be the absence of items relating to spirituality. Its relevance as a component of mental well-being is still debated. It should be noted that, at the beginning of the development of the WEMWBS, it was deliberated that only items that were more probable to obtain endorsement at the general population level in UK should be included in the scale (Tennant et al., 2007).

On the other hand, strengths of the WEMWBS are certainly its focus on positive affect and its sole use of positive words, beyond its short length and simple scoring. In this respect, a qualitative research (Crawford et al., 2011), which focused on the views of people with psychosis and affective disorders about the importance and acceptability of frequently used outcome measures, underlies the worth of the WEMWBS. The service users who took part in the study liked the WEMWBS and appreciated the way it inquires about positive aspects of mental health. In general, findings highlight the importance of using patient-rated outcome measures and the inclusion of measures of positive affect as well as negative affect within interventions and treatments implemented in mental health.

## **CHAPTER 5: PSYCHOMETRIC PERFORMANCE OF WEMWBS IN PREDICTING POSTNATAL DEPRESSION AS DEFINED BY THE EDINBURGH POST-NATAL DEPRESSION SCALE**

### **5.1. Introduction and Aims**

The construct of positive mental health as a concept that is distinct from, and more than the absence of, mental illness is receiving extensive attention by current empirical research.

The request of tools able to monitor mental well-being at the population level and to evaluate mental health promotion programmes is a result of an increasing interest in mental well-being.

Mental well-being is a complex construct that concerns the combination of hedonic and eudemonic perspectives.

The WEMWBS, a short and psychometrically robust scale, is a measure of mental well-being covering both eudemonic and hedonic aspects, designed to support mental health promotion initiatives and monitor mental health at the general population level.

Our main purpose was the validation of the ability of the WEMWBS to identify people at risk of post-natal depression, an important clinical condition in both mothers and fathers.

We examined the WEMWBS performance in screening subjects at risk of Post-natal Depression considering the Edinburgh Postnatal Depression Scale (EPDS, Cox et al., 1987) as gold standard, as it is one of the widely used tools to screen for Post-natal depression.

The WEMWBS items cover positive attributes and are all worded positively. As mentioned above (Chapter 4), Crawford and colleagues (2011) showed that people with mental illness prefer the WEMWBS to other measures; thus, it is reasonable to wonder whether the WEMWBS might work better also with women in post-natal period. This is a sensible period in which parents (overall mothers) barely are able to admit to feeling anything other than wonderful after they have had a baby. Hence, a tool focused on only positive aspects of mental health may work better than other tools focused on negative states, during postnatal period.

## **5.2. Method**

### **5.2.1 Participants and data collecting**

Data for the present study were obtained during a more wide research project undertaken in 2003-2007 (Jones et al., 2011) whose aim was to develop and psychometrically assess two instruments covering both positive and negative postnatal health of mothers (M-PHI, Mother's postnatal health instrument) and fathers (F-PHI, Father's postnatal health instrument) during the first year of childbearing. Sheffield Health and Social Care Research Consortium and North Sheffield Research Ethics Committee provided ethical and research governance approval. All participants provided written informed consent before participating.

M-PHI and F-PHI were development in four stages.

Stage 1: Focus group consultation;

Stage 2: Qualitative interviews;

Stage 3: Phase 1: Pilot postal survey; Phase 2: Main postal survey;

Stage 4: Test-retest reliability survey.

We examined EPDS and WEMWBS total scores. They were obtained in November 2006 by the Main postal survey (Stage 3) and the Test-retest reliability survey (Stage 4) administrations. The EPDS and the WEMWBS were included in order to assess criterion validity of M-PHI and F-PHI in two different times, T1 and T2.

For T1 (Stage 3), EPDS and WEMWBS were administered to a random sample of 1000 mothers who had had a baby in the previous 12 months. They were identified from the Royal Hallamshire Hospital, Jessop Wing database, Sheffield. Questionnaires for the fathers were sent in the same pack as the mothers' questionnaires.

For T2 (Stage 4), EPDS and WEMWBS were administered to all mothers and fathers who returned a complete postnatal questionnaire in Stage 3 in 3-6 days after they had completed the first set of questionnaires.

### **5.2.2 Measures**

#### **The WEMWBS**

The WEMWBS (Warwick-Edinburgh Mental Well-Being Scale, Tennant et al., 2007) is a 14 item self-report measure of mental well-being. It represents a broad view of this construct, providing information on positive affect (feeling of optimism, relaxation and cheerfulness), satisfying interpersonal relationships and positive functioning (energy, clear thinking, self-acceptance, personal development, competence and autonomy). Scoring consists of 5-point Likert scale (1= none of the time, 2= rarely, 3= some of the time, 4= often, 5= all of the time) yielding a total range of 14-70 and all items are scored positively. Individuals were asked to “tick

the box that best describes your experience of each over the last 2 weeks” and a high score corresponds to a high level of mental-well-being.

### **The EPDS**

The Edinburgh Postnatal Depression Scale (EPDS, Cox et al., 1987) is the most extensively used screening questionnaire for Post-natal depression (Boyd et al., 2005). It consists of 10-item self-report items in which women are asked to rate how they have felt in the previous seven days. Each item is scored on a four point scale (0-3), yielding a total range of 0-30. It is easy to fill in and completion takes around five minutes.

### **Post-natal depression and the EPDS, in both mothers and fathers**

A meta-analysis of almost sixty studies found that Postnatal Depression (PND) affects around 10-15% of women. These women are twice as likely to live episodes of depression over future five years (O’Hara et al., 1996). Beyond distress and socially debilitation in new mothers, PND has a significant impact on the mental health of infants such as the risk to develop psychopathology and behavioural problems (Downey and Coyne, 1990). It may also produce adverse effects on their partners (Loveston and Kumar, 1993) and family (Boath et al., 1998).

The EPDS has been found to be acceptable to women in the community and it does not require specialized psychiatric expertise from health workers. One of the main reasons behind developing the EPDS concerned limitations of screening scales for depression when they are used to identify depressed mothers at perinatal period, such as the Anxiety and Depression Scale

(Bedford and Foulds, 1978), the 30-item General Health Questionnaire (Goldberg et al., 1970), the Beck Depression Inventory (Beck et al., 1961), the Zung Depression Scale (Zung, 1965) according to Cox and colleagues (1987) and the Centre for Epidemiological Studies-Depression scale (CES-D, Radloff, 1977) according to Matthey and colleagues (2001). Their emphasis on the somatic symptoms, which is expected to occur in the normal course of changes associated with postpartum period, may be a possible explanation (Cox et al., 1987). Hence, the authors of EPDS decided to develop a self-report scale in which symptoms such as fatigue and changes in appetite were excluded (Murray and Cox, 1990). EPDS has been validated for English-speaking women in Britain (Cox et al., 1987; Harris et al., 1989; Murray and Carothers 1990) and is routinely administered to woman at 6-8 weeks postnatally in several zones of United Kingdom. It is used in multiple translations and has been validated in many countries (Eberhard-Gran et al., 2001; Gibson et al., 2009). It is used also as a screening tool for antenatal depression (Murray and Cox, 1990).

Satisfactory psychometric properties were proved (standardized alpha coefficient of 0.87 and a Spearman-Brown coefficient of 0.88 as measure split-half reliability).

Cox and colleagues (1987) administering the EPDS to a UK small sample (84 mothers) 3 months after their delivery and, using the Research Diagnostic Criteria (Spitzer et al., 1975) as criterion measure, identified the optimum cut-off point of 12.5. It was the best in maximizing sensitivity (the proportion of depressed women who were true positives) and specificity (the proportion of non-depressed women who were true negatives). Sensitivity of 86% (CI, 0.70-0.95) and specificity of 78% (CI, 0.63-0.88) were found. The women who scored above a cut-off point of 12.5 were most likely to be suffering from a depressive illness of varying severity. Positive Predicted Value (the proportion of women

above the cut-off point on the EPDS who met RDC criteria for depression) was 73%. Authors also suggested that a cut-off point of 9.5 might be appropriate if the EPDS is proposed for routine use by primary care workers. In a further study (Harris et al., 1989), the EPDS was administered to 147 mothers in UK at six weeks after delivery and sensitivity and specificity were calculated using DSM-III (APA, 1980) for major depression. At 12.5 threshold corresponded high values of sensitivity and specificity, 0.95% (0.77-1.0) and 0.93% (CI, 0.89-0.98), respectively. It should be underlined that almost half of the sample was included because they were affected of hyperthyroidism.

The EPDS was also validated in a large UK representative and randomized sample at six weeks after delivery. Murray and Carothers (1990), using a cut-off point of 12.5, found a specificity rate of 96% but a lower sensitivity value of 68% than those identified in the first studies. These validation data support the utility of the EPDS to screen for depressed mothers during post-natal period. To a further sample recruited in south London Hospital was administered EPDS at 3 months after delivery (Leverton et al., 2000). Using ICD-10 as criterion tool, it was found that a cut-off of 12.5 gave a sensitivity of 70%, specificity of 93% and positive predictive value of 33%, whereas a cut-off point of 9.5 gave a sensitivity of 90%, specificity of 84% and positive predictive value of 23%.

Several studies also took place in different countries where the English language is spoken (e.g. USA, Beck et al., 2001; Australia, Boyce et al., 1993; Canada, Clark 2008). The validation data obtained in these studies suggested that, with a cut-off point of 12.5, the EPDS has acceptable sensitivity and specificity (Gibson et al., 2009).

The EPDS is also used in many languages other than English and has been validated in different countries obtaining satisfactory sensitivity and specificity rates at different EPDS cut-off points (Eberhard-Gran et al., 2001). Examples are: Portugal (9.5, se=65% and sp=96%, Areias et al., 1996), France (10.5, se=80% and sp=92%, Guedeney et al. 1997), Italy (8.5, se=94% and sp=87% Benvenuti et al., 1999), Norway (9.5, se=100% and sp=87%, Eberhard-Gran et al., 1999), Sweden (9.5, se=90% and sp=92%, Lundh and Gyllang, 1993), China (9.5, se=82% and sp=86%, Lee et al., 1998), and Chile (9.5, se=100% and sp=80%, Jadresic et al., 1995).

Although incidence, risk rates and outcomes linked to mother depression are well documented, paternal postnatal depression has received poor attention from researchers. Nevertheless, the emerging research suggests new fathers are also at increased risk of depression at this sensitive time (Goodman, 2004). According to Madsen and Juhl (2007), several studies (most of them including small samples) show 2–24% of fathers with post-natal depression and the presence of a correlation between maternal postpartum depression and paternal postpartum depression. A meta-analysis of 43 studies (n = 28,004) found a prevalence rate of paternal depression between the first trimester and one year postpartum of 10,4% and that it was higher in the 3 and 6 month postpartum (Paulson et al., 2010). Ramchandani and colleagues (2005) studied negative child outcomes associated to the paternal depression in the period after their partner delivery. It was identified a higher risk of behavioural problems at age 3.5 years in their baby.

Several studies tried to prove the usefulness of the EPDS as a tool to screen for paternal depression in postpartum community samples. Ballard and colleagues (1994) were the first to examine postnatal period in a sample of new fathers (n = 178) at six weeks post-partum in UK (Coventry). Using a semi-structured interview

named the Psychiatric Assessment Schedule (PAS, Dean et al., 1983), a sensitivity of 85.7 % and a specificity of 75% with the EPDS cut-off point of 12.5 were reported among mothers. It should be highlighted that they decided to use the 13-EPDS, an early version of EPDS. It was argued that it appeared to have a better sensitivity (irritability and mother infant relationship is the content of the three items which were omitted in the EPDS final version). Others studies have been carried-out among fathers (e.g. Areias et al., 1996). Matthey et al. (2001) were the first researchers to validate the EPDS in fathers. It was compared with CES-D (Radloff, 1977) and the Diagnostic Interview Schedule (DIS, Robins et al., 1981) as criterion tools. This validation study proved good psychometric properties of EPDS when it is used in a population of new fathers (208 Australian fathers at six/seven weeks after the birth of their child) in terms of internal consistency (Cronbach's standardized alpha 0.81), split-half reliability (Spearman-Brown 0.78), construct validity (Spearman's  $r$  between EPDS and CES-D scores 0.62) and discriminant ability. Regard to the last one property, at the optimum cut-off point to screen for major and minor depression in father of 9.5, 71.4% of depressed men and 93.8% non-depressed men were correctly classified, with only 7 % of the subjects were misclassified.

Recently, another study has showed the discriminant ability of the EPDS when it is used to screen for major depressive disorder in new fathers. Edmondson and colleagues (2010) administering the EPDS and the Structured Clinical Interview for DSM-IV (SCID, First et al., 1997) to a UK sample of fathers at seven weeks postpartum, found a score of 10.5 as the optimal cut-off point. This cut-off point yielded a sensitivity of 77.3 % and specificity of 92.9% with an AUC value of 0.96 (95% confidence interval: 0.864-0.967). This depression cut-off point is comparable to that found by Matthey and colleagues (2010). The slight difference between these two cut-off points may be

explained by the inclusion of both minor and major depressed subjects in the Australian sample (Edmondson et al., 2010).

A different threshold was established in a large Chinese sample, in which the most appropriate cut-off of 10.5 yielded a sensitivity of 91% and a specificity of 97% in detecting depression in new fathers at eight weeks after delivery (Lay et al., 2010). Moreover, EPDS was found to be superior over the Beck Depression Inventory (BDI, Beck et al., 1961) and the nine-item depression module of the Patient Health Questionnaire (PHQ-9, Kroenke et al., 2001) in detecting postnatal depression. Cronbach's standardized alpha of 0.87 and a Spearman-Brown coefficient of 0.84 (to measure Split-half reliability) were found.

### **5.2.3 Statistical analysis**

Statistical analyses were performed using the Statistical Package for Social Sciences, 19th version.

We ran scatter plot graphs, Spearman's rho and Pearson r correlations between WEMWBS and EPDS total scores at T1 and T2 in order to verify their correlation trend over time. P value was fixed at 0.01 level and 1-tailed test of significance was chosen because of the hypothesis of negative correlation between WEMWBS and EPDS scores. We expected that WEMWBS high score were associated with EPDS low score. Coefficients of determination, namely the proportion of the variation of one variable explained by the other, will be show. Descriptive statistics and score distributions for total scores obtained by the administration of both instruments were also calculated. Analyses were run for mothers and fathers samples separately and combined.

Receiver Operating Characteristics (ROC) analyses were run and ROC curves, that plots sensitivity versus 1-specificity for every possible cut-off point, were obtained.

Sensitivity, specificity, false positive and false negative rates, Area Under the Curve (AUC) and its relative interval of confidence at 95% levels of the WEMWBS for PND (Post-Natal Depression) were calculated at both T1 and T2. These values were found considering the EPDS as gold standard at three different cut-off points, which were identified as useful to screening PND at the general population level (two cut-off points of 12.5 and 9.5 in new-mothers and a cut-off point of 9.5 in new-fathers). It was demonstrated that in mothers who score over than 12.5 and 9.5 the likelihood of depression during post-natal period are considered high and moderate, respectively (Cox et al., 1987). Fathers who score over than 9.5 are considered at risk for major and minor depression during post-natal period (Matthey et al, 2001).

WEMWBS cut-off values that corresponded to dichotomous criterion variables were examined. Dichotomous criterion variables were computed dichotomizing EPDS total scores for each EPDS cut-off points of 12.5 and 9.5 in new-mothers and 9.5 in new-fathers at both T1 and T2.

WEMWBS cut-off values that maximized both sensitivity and specificity were determined. To better identify the best WEMWBS cut-off points to differentiate between persons with disorder and those without disorder, the Closest-to-(0,1) criterion (d) and the Youden Index (J) were calculated as well.

WEMWBS cut-off values chosen were supposed to distinguish mothers and fathers at risk of depression at the post-natal period from those who are not.

Finally, z-test for paired group (one-tailed;  $p < 0.01$ ) between T1 and T2 was calculated to compare the proportion of depressed

versus non-depressed subjects at the different times of administration of the WEMWBS.

### ***The Roc Curves***

Electrical and radar engineers during World War II were the first to develop the ROC curves. Their aim was to identify enemy objects in battlefields. Roc curves were rapidly introduced to psychology domain in order to study perceptual recognition of stimuli. Currently, ROC analyses are used in several disciplines and they are increasingly used in data mining research. The Receiver Operating Characteristic (ROC) analysis allows researchers and clinicians to determine the ability of tests to discriminate individuals with a characteristic from individuals without the characteristic. This statistical technique is based on logistic regression with a continuous predictor variable and dichotomous criterion variable (Kramer, 1992), for instance, in the current study, WEMWBS total score and a given cut-point of EPDS, respectively. The likelihood of every value of the predictor and its associated “sensitivity” and “1-specificity” values are derived after the logistic regression equation is estimated. According to the dichotomous criterion variable, *sensitivity* (Se) or True Positive Rate (TPR) is defined as the proportion of true positive tests and *specificity* (Sp) or True Negative Rate (TNR) is defined as the proportion of true negative tests. False Positive Rate (FPR) (1-specificity) and False Negative Rate (1-Sensitivity) are misclassifications.

In ROC analysis, likelihoods are plotted on a graph with sensitivity on the Y-axis and 1-specificity on the X-axis, named ROC curve. Each discrete point on the graph (named operating point) represents a cut-off score for a positive test result and its ability (as determined by sensitivity and specificity) to predict the dichotomous criterion variable. As one maximizes sensitivity, specificity will decrease (and vice versa). The score that

maximizes both sensitivity and specificity is considered the best cut-off value for the scale (Mennin et al., 2002).

Perkins and Schisterman (2005) illustrated two criteria in order to identify a single cut-off point (in the current study, WEMWBS cut-off point) that is the best, in statistical terms, to differentiate persons with disorder from those without disorder (in the present study, post-natal depression in both mothers and fathers).

The *Closest-to-(0,1)* criterion:  
 $d = \min \sqrt{(1 - Se)^2 + (1 - Sp)^2}$  and the *Youden Index*:  
 $J = \max Se + Sp - 1$ .

The logic behind the first approach is that the point on the curve closest to perfection (0,1 on the ROC curve) should correspond to the optimal cut-point available.

Instead, J represents the maximum vertical distance from the curve to the chance line (the diagonal line from 0,0 to 1,1 on the ROC curve). In other words, J is the point on the curve farthest from chance line.

Intuitively, the two criteria maximize and minimize the rates of persons who have been correctly and incorrectly classified. But d and J agree in some cases and disagree in others. Hence, it could be that d and J identify different cut-offs. Perkins and Schisterman (2005) recommend the use of J to find the “optimal” (statistical) cut-off. A mathematical reason is behind their suggestion: J reflects the intention of maximizing overall correct classification rates and consequently minimizing misclassification rates, whereas d includes a quadratic term for which the clinical meaning is indefinite.

Several summary indices are associated with the ROC curve. One of the most popular measures is the area under the

ROC curve (AUC). AUC is a combined measure of sensitivity and specificity. AUC is a measure of the overall performance of a test (in our study, the WEMWBS) and is interpreted as the average value of sensitivity for all possible values of specificity. AUC provide us an evaluation of the ability of our test to discriminate between subjects with and without a particular characteristic. It can take on any value between 0 and 1, since both the x and y axes have values ranging from 0 to 1. The closer AUC is to 1, the better the overall diagnostic performance of the test, and a test with an AUC value of 1 is one that is perfectly accurate (where  $Se=1$  and  $Sp=1$ ). According to the guideline suggested by Swets (1988), it could be distinguished between non-informative ( $AUC=0.5$ ), less accurate ( $0.5 < AUC \leq 0.7$ ), moderately accurate ( $0.7 < AUC \leq 0.9$ ), highly accurate ( $0.9 < AUC < 1$ ) and perfect ( $AUC=1$ ) test. Because sensitivity and specificity are independent of disease prevalence, AUC is also independent of disease prevalence.

AUC is frequently presented along with its 95% confidence interval (CI). It shows us that the true value of AUC lies with a certain degree of confidence. Its meaning is that the true value of AUC is within the 95% CI but there is a 5% chance of its being wrong. Hence, whether the lower bound of the 95% CI of AUC for a test is greater than 0.5, then the test is statistically significantly better (with a 5% chance of being wrong or a significance level of 0.05) than making the discriminate decision founded on chance, which has an AUC of 0.5 (Park et al., 2004).

### **5.3 RESULTS**

#### ***Characteristics of sample***

Mothers who completed the EPDS and the WEMWBS at T1 (baseline) were  $n = 199$  (19.9%) and  $n = 197$  (19.7%),

respectively. Fathers who completed the EPDS and the WEMWBS in T1 were  $n = 130$  (13%) and  $n = 137$  (13.7%), respectively.

Mothers and fathers who returned complete questionnaires within 1-week (T2) after they had completed the first set of questionnaires at T1 were:  $n=59$  (29.6%) and  $n=58$  (29.4%) mothers for the EPDS and the WEMWBS respectively;  $n=45$  (34.6%) and  $n=47$  (34.3%) fathers for respectively the EPDS and the WEMWBS.

It was not possible to re-issue the questionnaires to increase the response rates because of the limitations imposed by ethics committee.

With regard to demographic characteristics of mothers and fathers we may show only those relating to participants who completed the whole main postal survey at Stage 4 (Jones et al., 2011).

Age, Educational qualifications and Ethnicity were evaluated.  $N=185$  (18.5%) mothers and  $n=140$  (14%) fathers completed the entire main postal survey.

The means (relative SD; range) of age for both mothers and fathers were 30.9 (5.5; 16.4-43.8) and 33.0 (6.4; 19.7-52.5), correspondingly.

With regard to Educational qualifications different categories were explored: None, Lower secondary level (CSE/O' level, GCSE), Upper secondary level (A' Level/GCE/Further) and Tertiary level (Degree/Higher Degree).  $N=11$ ,  $n=47$ ,  $n=55$ ,  $n=68$  mothers and  $n=11$ ,  $n=31$ ,  $n=38$ ,  $n=49$  fathers belong respectively to the above mentioned categories.

With regard to ethnicity, different groups were explored. Mothers were  $n=157$  (84.9%) White British,  $n=1$  White Irish ,

n=2 White other, n=4 Black African, n=3 Black Caribbean, n=6 Pakistani, n=2 Indian, n=2 Bangladeshi, n=1 Chinese, n=2 Mixed Race, n=3 Other. Fathers were n=108 (77.1%) White British, n=0 White Irish, n=6 White other, n=3 Black African, n=2 Black Caribbean, n=4 Pakistani, n=2 Indian, n=1 Bangladeshi, n=2 Chinese, n=4 Mixed Race, n=4 Other.

Seventy-six of 185 mothers (41.3%) stated they had prior children, 158 were living with the child's father, 18 were living alone and 5 were living with their parents.

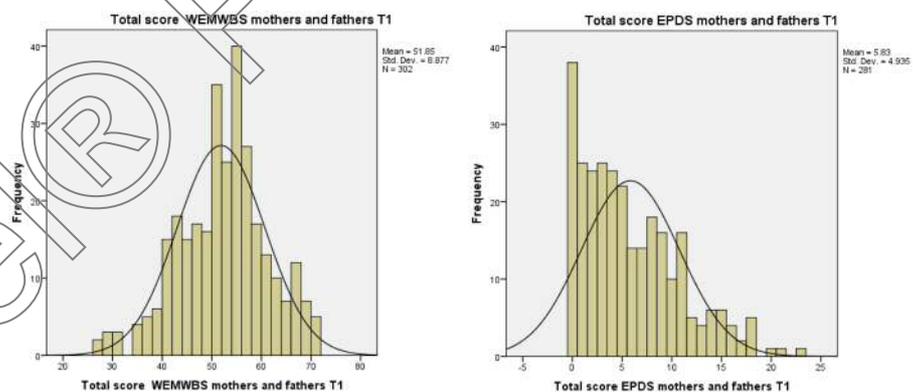
### ***Descriptive analyses of WEMMBS and EPDS scores***

The Mean, Median, Std. Deviation, Skewness, Kurtosis and score distributions for WEMWBS and EPDS total scores were calculated for both mothers and fathers at T1 and T2.

Total scores of WEMWBS obtained from both mothers and fathers at T1 are reported in Table 1 (see below). The mean score was of 51.85, median of 52.50, Std. Deviation of 8.87, Skewness of -.254, Kurtosis of .045. Total scores of EPDS obtained from both mothers and fathers are reported in Table 1 (see below). The mean score was of 5.83, median of 5.00, Std. Deviation of 4.93, Skewness of .874, Kurtosis of .239. WEMWBS data were slightly left skewed but we may state they were quite normal distributed. Instead, distribution for EPDS total scores was not normal distributed as we may see in score distribution reported in Fig.1.

**Table 1: Descriptive statistics for WEMWBS and EPDS total scores obtained by both mothers and fathers at T1**

		Total score WEMWBS mothers and fathers T1	Total score EPDS mothers and fathers T1
N	Valid	302	281
	Missing	53	74
Mean		51.85	5.83
Median		52.50	5.00
Std. Deviation		8.877	4.935
Skewness		-.254	.874
Std. Error of Skewness		.140	.145
Kurtosis		.045	.239
Std. Error of Kurtosis		.280	.290
Minimum		27	0
Maximum		70	23



**Fig. 1: Score distribution for WEMWBS and EPDS total scores obtained by both mothers and fathers at T1**

We ran scatter plot graphs, Spearman's rho and Pearson's r correlations between WEMWBS and EPDS total scores for both mothers and fathers at T1. We chose to run a non-parametric test

(Spearman's rho) because of the violation of normal distribution showed by EPDS scores. Nevertheless, we also chose to show the Pearson's correlation value. Scatter plot shows  $R^2$  Linear= 0.447 indicating a coefficient of determination of 20%, that is the variance the two variables share. Spearman's rho and Pearson's r were of -.642 and -.668 ( $P < 0.01$ , 1-tailed), respectively. According to Cohen (1988) a large ( $r = .50$  to  $1.0$ ) negative correlation was found (Fig.2, Table 2).



**Fig. 2: Scatter plot of WEMWBS and EPDS total scores for both mothers and fathers at T1**

**Table 2: Spearman's rho and Pearson's r correlations for both mothers and fathers at T1**

<b>Spearman's correlation</b>			
		<b>Total score WEMWBS mothers and fathers T1</b>	<b>Total score EPDS mothers and fathers T1</b>
Total score WEMWBS mothers fathers T1	Correlation Coefficient	1.000	-.642**
	Sig. (1-tailed)		.000
	N	302	255
Total score EPDS mothers fathers T1	Correlation Coefficient	-.642**	1.000
	Sig. (1-tailed)	.000	
	N	255	281
** . Correlation is significant at the 0.01 level (1-tailed).			

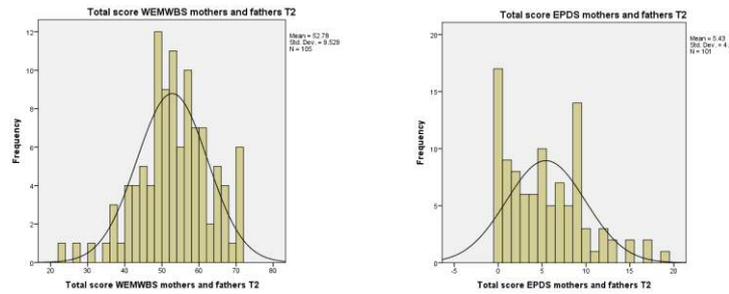
<b>Pearson's correlation</b>			
		<b>Total score WEMWBS mothers and fathers T1</b>	<b>Total score EPDS mothers and fathers T1</b>
Total score WEMWBS mothers fathers T1	Pearson Correlation	1	-.668**
	Sig. (1-tailed)		.000
	N	302	255
Total score EPDS mothers fathers T1	Pearson Correlation	-.668**	1
	Sig. (1-tailed)	.000	
	N	255	281
** . Correlation is significant at the 0.01 level (1-tailed).			

WEMWBS and EPDS total scores produced at T2 from mothers and fathers combined were similar to the previous shown.

Values were of 52.78 (mean), 52.00 (median), 9.52 (Std. Deviation), -.350 (Skewness), .381 (Kurtosis) and 5.43 (mean), 5.00 (median), 4.5 (Std. Deviation), -.713 (Skewness), .099 (Kurtosis) for WEMWBS and EPDS scores, respectively. WEMWBS total scores were slightly skewed toward left. Nevertheless, we may argue they were reasonable normal distributed. However, normal distribution for EPDS total scores was violated as we may see in distribution of scores illustrated in Fig.3 (Table3, Fig. 3).

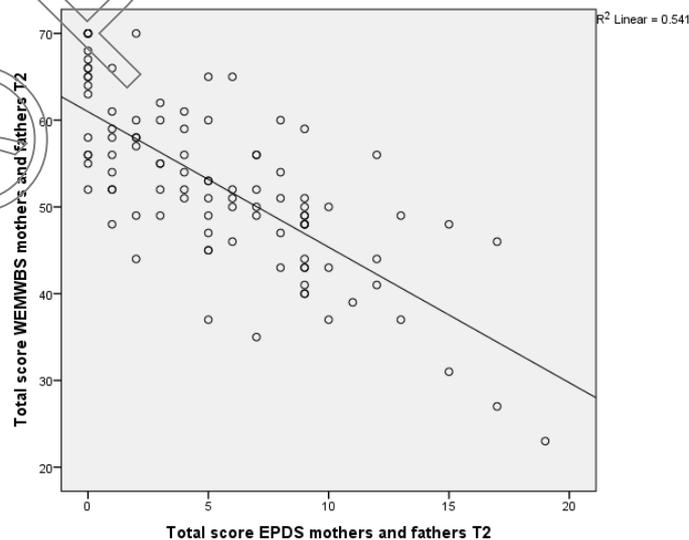
**Table 3: Descriptive statistics for WEMWBS and EPDS total scores obtained by both mothers and fathers at T2**

		Total score WEMWBS mothers and fathers T2	Total score EPDS mothers and fathers T2
N	Valid	105	101
	Missing	2	6
Mean		51.85	52.78
Median		52.50	52.00
Std. Deviation		8.877	9.529
Skewness		-.254	-.350
Std. Error of Skewness		.140	.236
Kurtosis		.045	.381
Std. Error of Kurtosis		.280	.467
Minimum		27	23
Maximum		70	70



**Fig. 3: Score distribution for WEMWBS and EPDS total scores obtained by both mothers and fathers at T2**

Scatter plot graph, Spearman's rho and Pearson r correlations between WEMWBS and EPDS total scores for both mothers and fathers at T2 were run and better results than the previous shown were found. Value of  $R^2$  Linear was 0.541 showing the variance the two variables shared was 30%. Spearman's rho and Pearson r were of -.731 and -.736 ( $P < 0.01$ , 1-tailed), respectively. According to Cohen (1988) a large ( $r = .50$  to 1.0) negative correlation was found (Fig.4, Table 4).



**Fig. 4: Scatter plot of WEMWBS and EPDS total scores for both mothers and fathers at T2**

**Table 4: Spearman's rho and Pearson's r correlations for both mothers and fathers at T2**

<b>Spearman's correlation</b>			
		<b>Total score WEMWBS mothers and fathers T2</b>	<b>Total score EPDS mothers and fathers T2</b>
Total score WEMWBS mothers fathers T2	Correlation Coefficient	1.000	-.731**
	Sig. (1-tailed)		.000
	N	105	99
Total score EPDS mothers fathers T2	Correlation Coefficient	-.731**	1.000
	Sig. (1-tailed)	.000	.
	N	99	101
**. Correlation is significant at the 0.01 level (1-tailed).			

<b>Pearson's r correlations</b>			
		<b>Total score WEMWBS mothers and fathers T2</b>	<b>Total score EPDS mothers and fathers T2</b>
Total score WEMWBS mothers fathers T2	Pearson Correlation	1	-.736**
	Sig. (1-tailed)		.000
	N	105	99
Total score EPDS mothers fathers T2	Pearson Correlation	-.736**	1
	Sig. (1-tailed)	.000	
	N	99	101
**. Correlation is significant at the 0.01 level (1-tailed).			

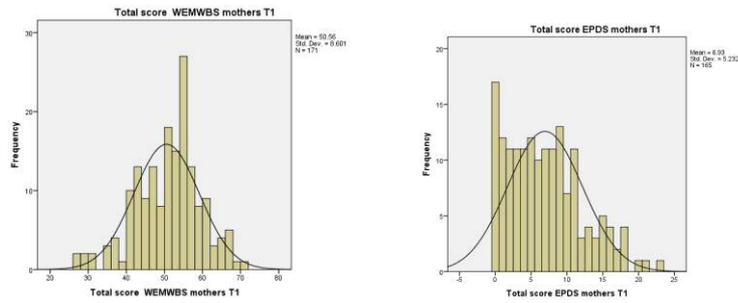
We also examined the Mean, Median, Std. Deviation, Skewness, Kurtosis and score distributions for WEMWBS and

EPDS total scores for mothers and fathers separately, at both T1 and T2.

Total scores of WEMWBS and EPDS obtained by only mothers at T1 showed the following values: mean=50.56, median=52.00, Std. Deviation=8.60, Skewness=-.395, Kurtosis=.192 and mean=6.93, median=6.00, Std. Deviation=5.23, Skewness=.655, Kurtosis=-.126, respectively. Although WEMWBS data were slightly skewed on the left, we may claim they are quite normally distributed. In contrast, distribution for EPDS total scores was not normally distributed as we may see in score distribution reported in Fig.5 (Table5, Fig. 5).

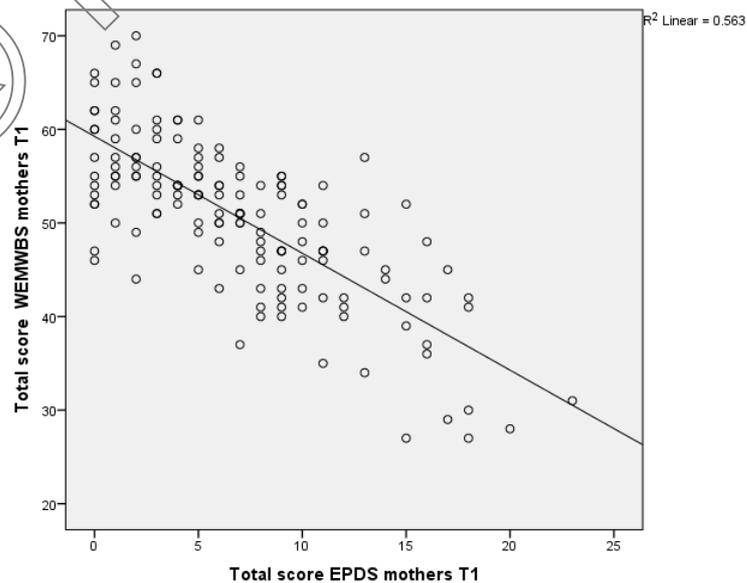
**Table 5: Descriptive statistics for WEMWBS and EPDS total scores obtained by both mothers at T1**

		Total score WEMWBS mothers T1	Total score EPDS mothers T1
N	Valid	171	165
	Missing	37	43
Mean		50.56	6.93
Median		52.00	6.00
Std. Deviation		8.601	5.232
Skewness		-.395	.655
Std. Error of Skewness		.186	.189
Kurtosis		.192	-.126
Std. Error of Kurtosis		.369	.376
Minimum		27	0
Maximum		70	23



**Fig. 5: Score distribution for WEMWBS and EPDS total scores obtained by mothers at T1**

Scatter plot graph, Spearman's rho and Pearson r correlations between WEMWBS and EPDS total scores for mothers at T2 were run and slight better results than those relate to mothers and fathers together at both T1 and T2 were found. Value of  $R^2$  Linear was 0.563 indicating the variance the two variables shared was 32%. Spearman's rho and Pearson r were of -.723 and -.751 ( $P < 0.01$ , 1-tailed), respectively. According to Cohen (1988) a large ( $r = .50$  to 1.0) negative correlation was found (Fig.6, Table 6).



**Fig. 6: Scatter plot of WEMWBS and EPDS total scores for mothers at T1**

**Table 6: Spearman's rho and Pearson's r correlations for mothers at T1**

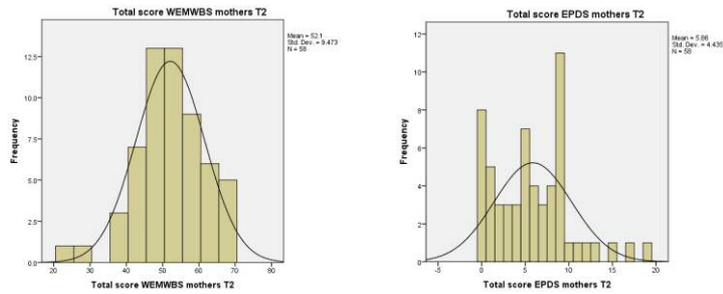
<b>Spearman's rho correlation</b>			
		<b>Total score WEMWBS mothers T1</b>	<b>Total score EPDS mothers T1</b>
Total score WEMWBS mothers T1	Correlation Coefficient	1.000	-.723**
	Sig. (1-tailed)	.	.000
	N	171	151
Total score EPDS mothers T1	Correlation Coefficient	-.723**	1.000
	Sig. (1-tailed)	.000	.
	N	151	165
**. Correlation is significant at the 0.01 level (1-tailed).			

<b>Person's r correlation</b>			
		<b>Total score WEMWBS mothers T1</b>	<b>Total score EPDS mothers T1</b>
Total score WEMWBS mothers T1	Pearson Correlation	1	-.751**
	Sig. (1-tailed)		.000
	N	171	151
Total score EPDS mothers T1	Pearson Correlation	-.751**	1
	Sig. (1-tailed)	.000	
	N	151	165
**. Correlation is significant at the 0.01 level (1-tailed).			

Data obtained by mothers at T2 showed the following values: 52.10 (mean), 51.00 (median), 9.47 (Std. Deviation), -.487 (Skewness), .866 (Kurtosis) and 5.86 (mean), 5.50 (median), 4.43 (Std. Deviation), .655 (Skewness), .438 (Kurtosis) (see below Table7). They refer to WEMWBS and EPDS total scores, respectively. WEMWBS total scores show data slightly skewed left but we can state they are quite normal distributed. Instead, normal distribution for EPDS total scores is violated as we may see in distribution of scores illustrated in Fig.7

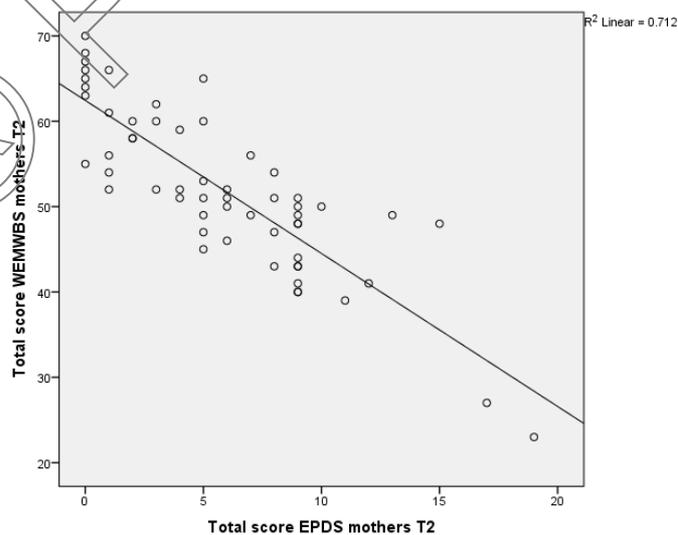
**Table 7: Descriptive statistics for WEMWBS and EPDS total scores obtained by mothers at T2**

		Total score WEMWBS mothers T2	Total score EPDS mothers T2
N	Valid	58	58
	Missing	1	1
Mean		52.10	5.86
Median		51.00	5.50
Std. Deviation		9.473	4.435
Skewness		-.487	.655
Std. Error of Skewness		.314	.314
Kurtosis		.866	.438
Std. Error of Kurtosis		.618	.618
Minimum		23	0
Maximum		70	19



**Fig. 7: Score distribution for WEMWBS and EPDS total scores obtained by mothers at T2**

Scatter plot graph, Spearman's rho and Pearson's r correlations between WEMWBS and EPDS total scores for mothers at T2 were run and better results than the all previous shown were found. Value of  $R^2$  Linear was 0.712 showing the variance the two variables shared was 51%. Spearman's rho and Pearson r were of -.843 and -.844 ( $P < 0.01$ , 1-tailed), respectively. According to Cohen (1988) a large ( $r = .50$  to  $1.0$ ) negative correlation was found (Fig.8, Table 8).



**Fig. 8: Scatter plot of WEMWBS and EPDS total scores for mothers at T2**

**Table 8: Spearman's rho and Pearson's r correlations for mothers at T2**

<b>Pearson's correlation</b>			
		<b>Total score WEMWBS mothers T2</b>	<b>Total score EPDS mothers T2</b>
Total score WEMWBS mothers T2	Pearson Correlation	1	-.844**
	Sig. (1-tailed)		.000
	N	58	57
Total score EPD mothers T2	Pearson Correlation	-.844**	1
	Sig. (1-tailed)	.000	
	N	57	58
**. Correlation is significant at the 0.01 level (1-tailed).			

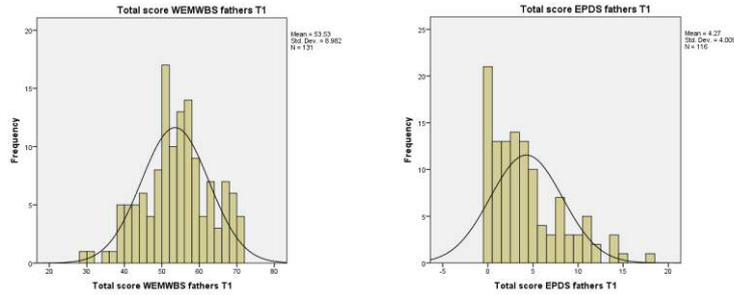
<b>Spearman's rho correlation</b>			
		<b>Total score WEMWBS mothers T2</b>	<b>Total score EPDS mothers T2</b>
Total score WEMWBS mothers T1	Correlation Coefficient	1.000	-.843**
	Sig. (1-tailed)	.	.000
	N	58	57
Total score EPDS mothers T1	Correlation Coefficient	-.843**	1.000
	Sig. (1-tailed)	.000	.
	N	57	58
**. Correlation is significant at the 0.01 level (1-tailed).			

Total scores of WEMWBS obtained from fathers at T1 showed the following values: mean=53.53, median=54.00, Std.

Deviation=8.98, Skewness=-.167, Kurtosis=-.223. Total scores of EPDS obtained by fathers showed the following values: mean=4.27, median=3.00, Std. Deviation=4.00, Skewness=1.113, Kurtosis=.760. Although WEMWBS total scores show were very slightly skewed on the left, we may argue they are quite normally distributed. Instead, distribution for EPDS total scores was not normally distributed (Table 9, Fig. 9).

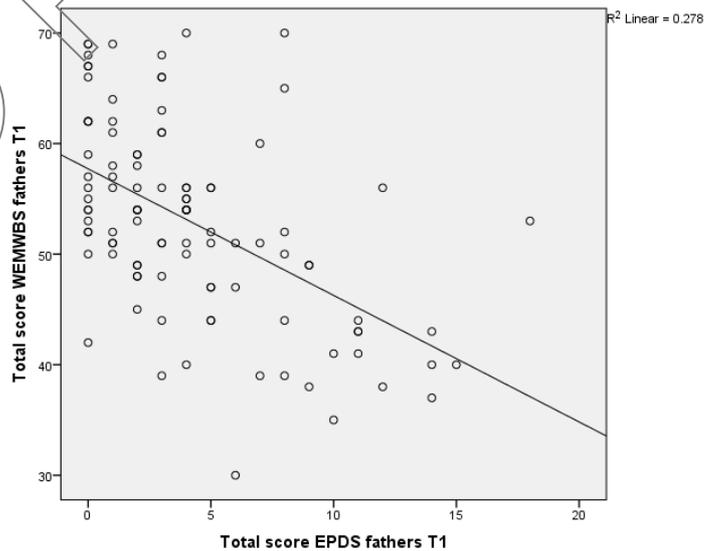
**Table 9: Descriptive statistics for WEMWBS and EPDS total scores obtained by fathers at T1**

		Total score WEMWBS fathers T1	Total score EPDS fathers T1
N	Valid	131	116
	Missing	16	31
Mean		53.53	4.27
Median		54.00	3.00
Std. Deviation		8.982	4.009
Skewness		-.167	1.113
Std. Error of Skewness		.212	.225
Kurtosis		-.223	.760
Std. Error of Kurtosis		.420	.446
Minimum		29	0
Maximum		70	18



**Fig. 9: Score distribution for WEMWBS and EPDS total scores obtained by fathers at T1**

Scatter plot graph, Spearman's rho and Pearson's r correlations between WEMWBS and EPDS total scores for fathers at T1 were run and worse results than the all previous shown were found. Value of  $R^2$  Linear was 0.278 showing the variance the two variables shared was 8%. Spearman's rho and Pearson r were of -.533 and -.523 ( $P < 0.01$ , 1-tailed), respectively. According to Cohen (1988) a large ( $r = .50$  to  $1.0$ ) negative correlation was found (Fig.10, Table 10).



**Fig. 10: Scatter plot of WEMWBS and EPDS total scores for fathers at T1**

**Table 10: Spearman's rho and Pearson's r correlations for fathers at T1**

<b>Spearman's rho correlation</b>			
		<b>Total score WEMWBS fathers T1</b>	<b>Total score EPDS fathers T1</b>
Total score WEMWBS fathers T1	Correlation Coefficient	1.000	-.533**
	Sig. (1-tailed)	.	.000
	N	131	104
Total score EPDS fathers T1	Correlation Coefficient	-.533**	1.000
	Sig. (1-tailed)	.000	.
	N	104	116
**. Correlation is significant at the 0.01 level (1-tailed).			

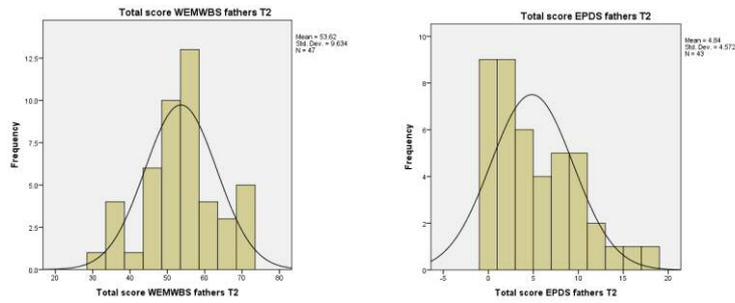
<b>Pearson's r Correlations</b>			
		<b>Total score WEMWBS fathers T1</b>	<b>Total score EPDS fathers T1</b>
Total score WEMWBS fathers T1	Pearson Correlation	1	-.527**
	Sig. (1-tailed)		.000
	N	131	104
Total score EPDS fathers T1	Pearson Correlation	-.527**	1
	Sig. (1-tailed)	.000	
	N	104	116
**. Correlation is significant at the 0.01 level (1-tailed).			

Data obtained for fathers at T2 showed the following values: 53.62 (mean), 55.00 (median), 9.63 (Std. Deviation), -.214 (Skewness), -.107 (Kurtosis) and 4.84 (mean), 4.00 (median), 8.66

(Std. Deviation), .866 (Skewness), -.025 (Kurtosis). They refer to WEMWBS and EPDS total scores, respectively. WEMWBS total scores were slightly skewed on the left but we may claim they were quite normally distributed. In contrast, normal distribution for EPDS total scores is violated as we may see in distribution of scores illustrated in Fig.11 (Table 11, Fig. 11).

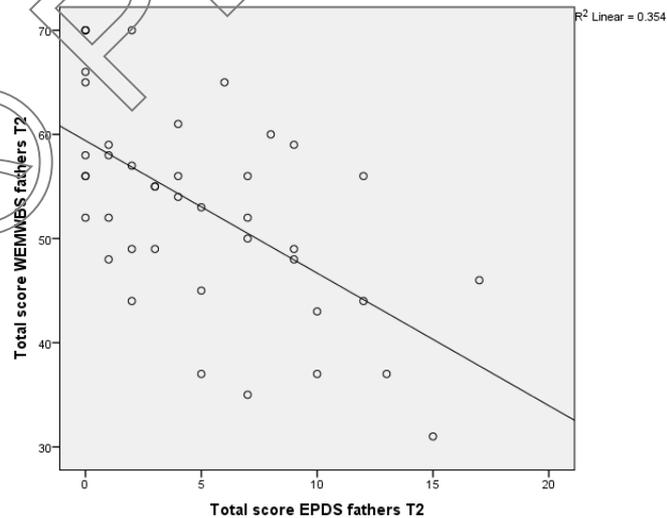
**Table 11: Descriptive statistics for WEMWBS and EPDS total scores obtained by fathers at T2**

		Total score WEMWBS fathers T2	Total score EPDS fathers T2
N	Valid	47	43
	Missing	1	5
Mean		53.62	4.84
Median		55.00	4.00
Std. Deviation		9.634	4.572
Skewness		-.214	.866
Std. Error of Skewness		.347	.361
Kurtosis		-.107	-.025
Std. Error of Kurtosis		.681	.709
Minimum		31	0
Maximum		70	17



**Fig. 11: Score distribution for WEMWBS and EPDS total scores obtained by fathers at T2**

Scatter plot graph, Spearman's rho and Pearson r correlations between WEMWBS and EPDS total scores for fathers at T2 were run and they were highly similar to those provided by fathers at T1. Scatter plot shows  $R^2$  Linear = 0.354 indicating a coefficient of determination of 35.4%. Spearman's rho and Pearson r were of -.582 and -.595 ( $P < 0.01$ , 1-tailed), respectively. According to Cohen (1988) a large ( $r = .50$  to  $1.0$ ) negative correlation was found (Fig.12, Table 12).



**Fig. 12: Scatter plot of WEMWBS and EPDS total scores for fathers at T2**

**Table 12: Spearman's rho and Pearson's r correlations for fathers at T2**

<b>Spearman's correlation</b>			
		<b>Total score WEMWBS fathers T2</b>	<b>Total score EPDS fathers T2</b>
Total score WEMWBS fathers T2	Correlation Coefficient	1.000	-.582**
	Sig. (1-tailed)	.	.000
	N	47	42
Total score EPDS fathers T2	Correlation Coefficient	-.533**	1.000
	Sig. (1-tailed)	.000	.
	N	104	116
**. Correlation is significant at the 0.01 level (1-tailed).			

<b>Pearson's r correlation</b>			
		<b>Total score WEMWBS fathers T2</b>	<b>Total score EPDS fathers T2</b>
Total score WEMWBS fathers T2	Pearson Correlation	1	-.595**
	Sig. (1-tailed)		.000
	N	47	42
Total score EPDS fathers T2	Pearson Correlation	-.595**	1
	Sig. (1-tailed)	.000	
	N	42	43
**. Correlation is significant at the 0.01 level (1-tailed).			

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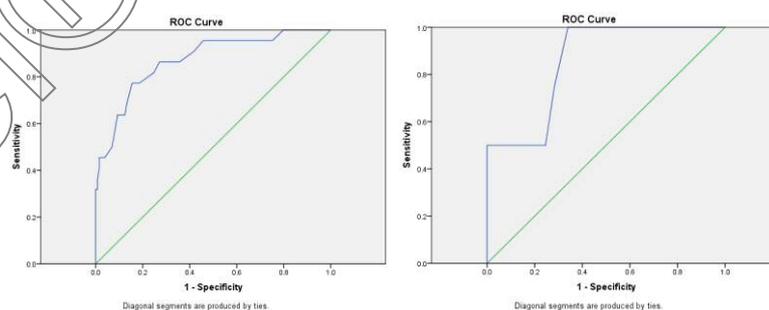
## **ROC Curves**

The ROC curves were run for mothers and fathers separately at both T1 and T2.

We considered two EPDS cut-off points of 12.5 and 9.5, respectively for high and moderate likelihood of depression in mothers during the post-partum period. With regard to fathers, the EPDS cut-off point of 9.5 was considered to discriminate men at risk of minor and major depression in post-natal period.

Firstly, we ran ROC analysis considering an EPDS cut-off point of 12.5 for high likelihood of depression in mothers during the post-partum period. N=22 positive cases and N=129 negative cases at T1 and N=4 positive cases and N=53 negative cases at T2 were discriminated.

Area Under the Curve (AUC) and relative 95% Confidence Interval were .872 (.788-.955) and .856 (.699-1.000) at T1 and T2, respectively. According to the guideline suggested by Swets (1988), it could be indicated that the WEMWBS resulted to be moderately accurate ( $0.7 < \text{AUC} \leq 0.9$ ) in screening a depressive condition. We can underline that AUC values are extremely close to 0.9. ROC curves were plotted at T1 and T2 (see below Fig. 13).



**Fig. 13 ROC curves for EPDS cut-off point of 12.5. Results for mothers at T1 and T2**

Sensitivity, specificity, false positive and false negative rate, Area Under the Curve (AUC) and relative confidence

interval, d (the closest-to-0,1 criterion) and J (Youden index) for each WEMWBS cut-off point with a EPDS cut-off point of 12.5 as gold standard in mothers (results at T1 and T2) are reported in Table 13.

**Table 13: WEMWBS cut-off points considering an EPDS cut-off point of 12.5 as gold standard in mothers. Results at T1 and T2**

	WEMWBS CUT-OFF POINTS	Se (%)	Sp (%)	FPR (%)	FNR (%)	d	J	AUC	95%CI
T1	45.5	77.3	84.5	15.5	22.7	0.28	0.62	0.872	.788-.955
	46.5	77.3	81.4	18.6	22.7	0.29	0.59	0.872	.788-.955
	47.5	81.8	75.2	24.8	18.2	0.31	0.57	0.872	.788-.955
	48.5	86.4	72.9	27.1	13.6	0.3	0.59	0.872	.788-.955
	49.5	86.4	70.5	29.5	0.136	0.32	0.57	0.872	.788-.955
T2	45.5	50	81.1	18.9	50	0.53	0.31	0.856	.699-1.000
	46.5	50	79.2	20.8	50	0.54	0.29	0.856	.699-1.000
	47.5	50	75.5	24.5	50	0.56	0.25	0.856	.699-1.000
	48.5	75	71.7	28.3	25	0.38	0.47	0.856	.699-1.000
	49.5	100	66	34	0	0.34	0.66	0.856	.699-1.000

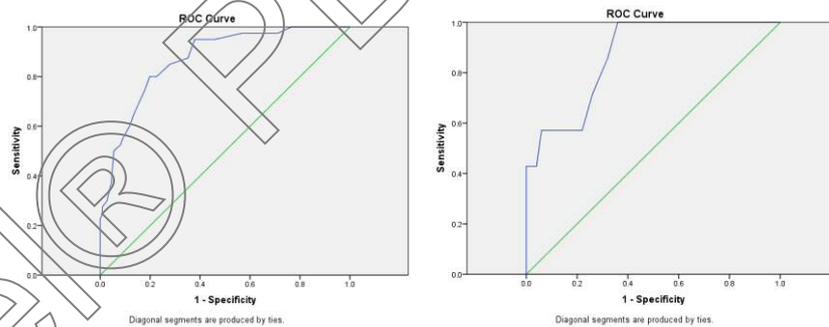
Considering an EPDS cut-off point of 12.5 as screener for a post-natal depression in mothers, a WEMWBS score range from 45.5 to 48.5 seemed the best in maximizing sensitivity and specificity values at T1. Both d and J criteria designed 45.5 as optimal WEMWBS cut point. At this score, Specificity (84.5%) is higher than Sensitivity (77.3 %); False Positive Rate is of 15.5% while False Negative Rate is of 22.7%. In the case it is considered relevant improving sensitivity percentage, the optimal WEMWBS cut-off point become 48.5 where the percentage of true positive cases is higher than the percentage of true negatives cases, 86.4% and 72.9%, respectively. At this score False Negative Rate is the lowest (13.6%) and False Positive Rate is higher (27.1%) than the previous. This cut-point is the best in maximizing sensitivity and specificity values at T2, though Sensitivity (75%) and Specificity (71.7%) are lower respect of those at T1. It can be also taken into consideration the score 47.5 as WEMWBS cut-off point, if it is considered pertinent improving the percentage of Specificity. At

this score, Sensitivity is still high (81.8%) and Specificity (75.2%) is higher than that corresponding to the score of 48.5.

The WEMWBS score of 49.5 is the optimal cut-off point according to d and J criteria at T2.

Secondly, we considered an EPDS cut-off point of 9.5 as screener for moderate likelihood of depression in mothers during the post-partum period. It was found that 40 cases were positive and 111 cases were negative at T1 while 7 and 50 were positive and negative cases respectively at T2.

Area Under the Curve (AUC) and relative 95% Confidence Interval were .871 (.810-.931) and .869 (.784-.989) at T1 and T2, respectively. They demonstrate the discriminant ability of WEMWBS in screening post-natal depression in mothers considering an EPDS cut-off score of 9.5. ROC curves were plotted at T1 and T2 (see below Fig. 14).



**Fig. 14 ROC curves for EPDS cut-off point of 9.5. Results for mothers at T1 and T2**

Sensitivity, specificity, false positive and false negative rate, Area Under the Curve (AUC) and relative confidence interval, d and J for each WEMWBS cut-off point with an EPDS cut-off point of 9.5 as gold standard in mothers (results at T1 and T2) are showed in Table 14.

**Table 14: WEMWBS cut-off points considering an EPDS cut-off point of 9.5 as gold standard in mothers. Results at T1 and T2.**

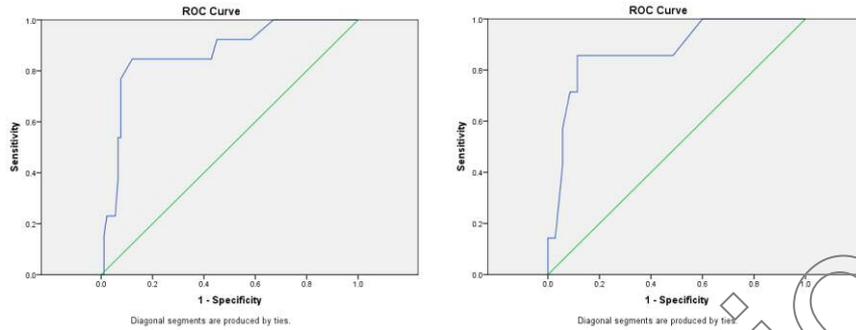
	WEMWBS CUT-OFF POINTS	Se (%)	Sp (%)	FPR (%)	FNR (%)	d	J	AUC	95%CI
T1	45.5	60	88.3	0.117	40	0.42	0.48	0.871	.810-.931
	46.5	65	86.5	13.5	35	0.38	0.51	0.871	.810-.931
	47.5	75	82	18	25	0.31	0.57	0.871	.810-.931
	48.5	80	80.2	19.8	20	0.28	0.6	0.871	.810-.931
	49.5	80	77.5	22.5	20	0.3	0.57	0.871	.810-.931
	50.5	85	72.1	27.9	15	0.32	0.57	0.871	.810-.931
T2	45.5	57.1	84	16	42.9	0.46	0.41	0.869	.748-.989
	46.5	57.1	82	18	42.9	0.46	0.39	0.869	.748-.989
	47.5	57.1	78	22	42.9	0.48	0.35	0.869	.748-.989
	48.5	71.4	74	26	28.6	0.39	0.45	0.869	.748-.989
	49.5	85.7	68	32	14.3	0.35	0.54	0.869	.748-.989
	50.5	100	64	36	0	0.36	0.64	0.869	.748-.989

Considering an EPDS cut-off point of 9.5, the WEMWBS score of 48.5 appears the optimal cut-point with high percentages of sensitivity (80%) and Specificity (80.2%). False positive Rate and False Negative Rate are 19.8% and 20%, respectively. Also for d and J criteria it is the best in maximizing sensitivity and specificity values at T1. This score demonstrate to be discriminant also in T2 but lower Sensitivity (71.4%) and Specificity (74%) than T1 are shown. According to d criteria the best cut-off is 49.5 (Se=85.7 and Sp=68) while J criteria choice is the cut-off of 50.5 with the perfect percentage (100%) of Sensitivity and 64% of Specificity.

Lastly, we considered an EPDS cut-off point of 9.5 as screener for minor and major depression in fathers during the post-partum period. We found 13 positive cases and 91 negative cases at T1; 7 positive cases and 35 negative cases at T2.

Area Under the Curve (AUC) shows that WEMWBS is a moderate accurate tool in screening post-natal depression in fathers. AUC values and relative Confidence Interval of 95 % were .870 (.765-.976) and .876 (.730-1.000) at T1 and T2,

respectively. ROC curves were plotted at T1 and T2 (see below Fig. 15).



**Fig. 15 ROC curves for EPDS cut-off point of 9.5. Results for fathers at T1 and T2**

Sensitivity, specificity, false positive and false negative rate, Area Under the Curve (AUC) and relative confidence interval, d and J for each WEMWBS cut-off point with an EPDS cut-off point of 9.5 as gold standard in fathers (results at T1 and T2) are presented in Table 15.

**Table 15: WEMWBS cut-off points considering an EPDS cut-off point of 9.5 as gold standard in fathers. Results at T1 and T2.**

	WEMWBS CUT-OFF POINTS	Se (%)	Sp (%)	FPR (%)	FNR (%)	d	J	AUC	95%CI
T1	44.5	84.6	87.9	12.1	15.4	0.2	0.73	0.87	.765-976
	46	84.6	86.8	13.2	15.4	0.2	0.71	0.87	.765-976
	47.5	84.6	83.5	16.5	15.4	0.23	0.68	0.87	.765-976
T2	44.5	71.4	91.4	8.6	28.6	0.3	0.63	0.876	.730-1.000
	45.5	71.4	88.6	11.4	28.6	0.31	0.6	0.876	.730-1.000
	47	85.7	88.6	11.4	14.3	0.18	0.74	0.876	.730-1.000

With regard to fathers at T1, the optimal WEMWBS cut-off in maximizing sensitivity and specificity values is doubtlessly the

score of 44.5. It shows high level of Sensitivity (84.6%) and Specificity (87.9%) and low percentages of False Positive (12.1%) and False Negative (15.4%) rates. At T2 it shows lower percentage of Sensitivity (71.4%) but higher level of Specificity (91.4%) than T1. The optimal WEMWBS cut-off score at T2 is surely 47 where Sensitivity is of 85.7% and Specificity is of 88.6%.

In general, we can state that AUC values found in mothers and fathers at both T1 and T2 were high. They ranged from .856 to .876.

The best ranges of WEMWBS scores in maximizing sensitivity and specificity tend to increase from T1 to T2 for each EPDS cut-off point. It is true for mothers and fathers. With the EPDS cut-off point of 12.5 in mothers the best WEMWBS score range was from 45.5 to 48.5 at T1 and from 48.5 to 49.5 at T2. Considering the EPDS cut-off point of 9.5 in mothers the best WEMWBS score from 48.5 at T1 and from 48.5 to 50.5 at T2. Finally, with the EPDS cut-off point of 9.5 the best WEMWBS score in maximizing sensitivity and specificity in father's sample were 44.5 and 47, at T1 and T2 respectively.

Additionally, AUC values tend to show a very slight decrease from T1 to T2 only in mothers (considering the EPDS cut-off point of 12.5 AUC values were .872 and .856 at T1 and T2 respectively; with the EPDS cut-off point of 9.5 AUC values were .871 and .869 at T1 and T2 respectively).

The optimal WEMWBS cut-off point for fathers (44.5, Se=84.6% and Sp=87.9%) was lower than those for mothers (47.5, Se= 81.8% and Sp=75.2%; 48.5, Se=84.4% and Sp=72.9%). They also show better percentages of Sensitivity and Specificity than the optimal WEMWBS cut-off scores for mothers.

### *Application of the cut-off points*

To show the utility of the WEMWBS to identify mothers at risk of post-partum depression, the established cut-off point (i.e., 48.5) was used to divide the sample of participants into subgroups according to the different degrees of depression. Instead, we did not follow the same procedure for fathers, because we did not find a reliable single cut-off point to be used in this case.

The proportion of mothers who presented a moderate to high level of depression (based on WEMWBS cut-off = 48.5) was 0.368 (n = 63, 37%) at T1 and 0.31 (n = 18, 31%) at T2. The value of the Z-test for paired group (one-tailed;  $p < .01$ ) between T1 and T2 was  $Z = 0.799$ . The result was  $p = .21$  and was not significant at  $p < .01$ . This indicates that the proportion of depressed mothers remained unchanged within a week.

## **5.4 DISCUSSION**

The main purpose of this research was to evaluate the ability of the WEMWBS to identify people who are at risk of Post-natal Depression at the general population level.

Preliminarily, we decided to study the WEMWBS and EPDS total scores distribution and the direction and strength of correlations between WEMWBS and EPDS total scores. Thus, before we calculated the Mean, Median Skewness, Kurtosis, score distributions before, then we run scatter plot graphs, Spearman's rho and Pearson's r for both mothers and fathers combined and separately, at T1 (baseline) and T2 (3-6 days later the first administration).

The WEMWBS median score of 52.50 obtained from the sample comprising mothers and fathers combined at T1 was

almost in line with that found by Tennant et al. (2007) in a UK sample population (Me=51). Probably, feelings connected to this particular period in life (post-natal period) are behind the slightly difference between the two median scores presented above. Additionally, median score relates to fathers sample was higher than that obtained from mothers, Me=54 and Me=52, respectively. It is also in line with differences observed across the gender in the same study (Tennant et al., 2007).

The WEMWBS total scores are normal distributed at T1 and T2 in each sample: mothers and fathers combined mothers and fathers separately. Instead, EPDS scores for mothers and fathers combined, mothers, fathers at both T1 and T2 show a non-normal distribution (see above Fig. 1, 3, 5, 7, 9, 11).

The first important outcome of the current study is the large correlation detected between the WEMWBS and the EPDS scores.

We decided to considerate Spearman's rho coefficient to detect the correlation between scores of the two questionnaires because of the violation of normal distribution of EPDS scores.

The Spearman's rho coefficient calculated for mothers and fathers combined at T1 showed a value of  $-.642$  ( $p < 0.01$ , 1-Tailed). A negative large correlation between the WEMWBS and the EPDS was found. Confidently, it is a firstly proof of the large correlation between the WEMWBS and one of the most used post-natal depression screening tool at general level population. We found that higher WEMWBS scores were associated to decreased mental illness in postnatal period.

We also chose to look at the strength of the correlation between mothers and fathers separately, and as we expected the correlation between WEMWBS and EPDS scores was higher for

mothers than for fathers. Spearman's rho values were -.723 and -.533 in women and man samples, respectively.

Comparing Spearman's rho values at the two different times (T1 and T2) we noticed that correlation's coefficients at T2 were higher than those at T1:  $r=-.731$  for mothers and fathers combined,  $r=-.843$  for mothers and  $r=.582$  for fathers.

The short period between the first administration and the second one possibly influenced the performance at T2.

Secondly, the other important result of the present study is that the WEMWBS performed well in screening post-natal depression, considering the EPDS as gold standard.

The high AUC values demonstrated the sensitivity of WEMWBS in discriminate between two groups: who are at risk to develop a PND and who are not.

Our data indicated that the 48.5 (namely, 48/49 or  $\leq 48$ ) cut-off point is the most appropriate for identifying woman with postnatal depression. Our chose was guided by the awareness of the importance to improve the percentage of true positive cases. Our priority was maximizing depression case-finding and minimizing missed cases because of the wide set of negative consequences may follow post-natal depression, in partner, baby and new mothers as well. We also decided to take in more consideration data obtained in T1. Our samples at T2 were small (mothers  $n=59/58$ ; fathers  $n=45/47$ ) and few days (within a week) were between baseline (T1) and follow-up (T2).

The WEMWBS cut-point of 48.5 is able to screen for both high and moderate likelihood of post-natal depression in new-mothers. In the first case (high likelihood), it yields a sensitivity of 84.4%, specificity of 72.9%, false positive rate and false negative rate of 27.1% and 13.6% respectively. In the second case (moderate likelihood), it shows a sensitivity of 80, specificity of

80.2%, false positive rate and false negative rate of 19.8% and 20 % respectively. It is clear that if we consider high likelihood of PND the sensitivity increase. Higher sensitivity and specificity are important clinical requirements for a measurement scale. WEMWBS showed to be able in identifying who truly are at risk of postnatal depression and who are truly not at a general level population.

Regarding fathers we were not able to recommend a WEMWBS cut-off in order to screen for minor and major depression in the post-natal period since we found two extremely different cut-off points (44.5 and 47.5) in the two administrations (T1 and T2).

The WEMWBS cut-off point established in this study to screen for post-partum depression was then used to describe the psychological condition of our sample of participants. At T1 the proportion of moderately to highly depressed mothers was 37%. At T2 the proportion of depressed mother was 31%. Taking into account the short time between the two administrations, we would expect that the WEMWBS scores remained unchanged.

The percentage of mothers at risk of post-partum depression in our sample was higher if compared to findings in the literature, which were represented by a rate of 10-15% (O'Hara et al., 1996). Several aspects would be taken into account to explain this discrepancy. Firstly, post-partum depression appears to be underdiagnosed (Epperson, 1999). Secondly, although aware of a potential increasing of false positive rates, we decided to maximize the WEMWBS ability to detect true positive cases (sensitivity). The severe impact of PND on the mental health of infants (Downey and Coyne, 1990), partners (Loveston and Kumar, 1993), and family (Boath et al., 1998) as well as distress and social debilitation in new mothers (Downey and Coyne, 1990) are behind our choice to increase the rate of true positive cases.

Finally, the WEMWBS is a screening tool aimed to detect who are at risk of developing depression during postpartum period. The presence of an actual clinical condition will be investigated using proper diagnostic tools. Nevertheless, it should be underlined that the WEMWBS detect for moderate as well as high risk of PND in order to provide a wide screening of this disease at the general population level.

Additionally, with regard to analyses conducted in order to choose the reliable WEMWBS cut-off of 48.5, ROC curves are not influenced by the disease prevalence (Park et al., 2004).

Our study is just a first step. We found that WEMWBS perform well in screening postnatal depression as defined by EPDS. We believe that the WEMWBS, as a tool completely focused on positive aspects of mental health, may work better than the EPDS (focused only on mental illness aspects) in screening for postnatal depression. Mothers may find less problematic to answer positive worded questions, because they probably will not admit of nothing but positive affect after their childbearing. The second step will be to look at the performance of WEMWBS and EPDS against a stronger gold standard (for example, diagnostic tools for postnatal depression).

There are some limitations of the current study. One relates to the validation of EPDS in fathers. There is only one validation study (Matthey et al., 2001) for the utility of the EPDS in fathers and the optimal cut-off of 9.5 was found in an Australian sample.

Another weakness is related to the short period between the two administrations and the fact that the EPDS and the WEMWBS refer to two different times (“in the past seven days” and “the last two weeks”, respectively).

Finally, the three EPDS cut-offs used as gold standard [ i.e. 12.5 and 9.5 for mothers (Cox et al., 1987) and 9.5 for fathers

(Matthey et al., 2001) ] were validated at 3 months and 6 weeks and 6/7 weeks after delivery in mothers and fathers, respectively. Instead, in our study data were collected in a sample of parents who had had a baby in the previous 12 months.

## 5.5 CONCLUSION

There is a growing interest in positive mental health in both research and clinical fields related to mental health.

The absence of valid tools which are appropriate for measuring positive mental health and mental wellbeing limits our ability to monitor mental well-being in the population and to evaluate initiatives to promote positive mental health.

The WEMWBS is a short psychometrically sound and positive worded scale which covers most aspects of both hedonic and eudemonic perspective of mental wellbeing.

A reason for its development was the limitations of instruments designed principally to detect mental illness when they are used to monitor wellbeing at the general population level. Mental illness tools tend to have significant ceiling effects in general population samples. In addition, when they are used to evaluate interventions of positive health promotion, they may influence the evaluation of participants, producing the erroneous impression that the intervention to promote health was designed only for people with mental illness.

Further studies had been undertaken after the basic establishment of WEMWBS in 2007. A good fit to the Rasch model was found and a shortened (seven items) version of WEMWBS was provided (Stewart-Brown et al., 2009). In addition a validation of WEMWBS with secondary school children aged 13 to 15 years was effectuated (Clarke et al., 2011).

The purpose of the current study was to provide another proof about the WEMWBS psychometric performance.

We found a large negative correlation between WEMWBS and EPDS. In other words, high scores on WEMWBS were associated with low scores on EPDS. We may state that another proof of WEMWBS criterion validity is given.

It may be argued that the not really strong correlation found between a tool covering the concept of mental well-being and another one measuring mental illness (postnatal depression in the current case) may be considered in line with recent findings in favour of the hypothesis that well-being and ill-being reflect two distinct latent factors. This hypothesis is in support of the current state that positive mental health is more than the simple absence of mental ill-ness and this is the rationale behind our purpose of investigating psychometric performances of the WEMWBS, an established measure of mental well-being.

The hypothesis above mentioned also underlined that mental illness and mental wellbeing are considered two distinct but overlapped dimension of mental health.

The overlapping of the two dimensions and the lack of established criteria for what is mental well-being constrain researchers to use mental-illness measure as gold standard in studies, which aim to investigate the psychometric performance of measures of well-being.

In the current study the main purpose was to analyse the psychometric performance of the WEMWBS considering the EPDS, the most widely used screening tool for postnatal depression, as gold standard. Our aim was to investigate the suitability of the WEMWBS as a screening tool for people at risk of postnatal depression. AUC values indicate that it is able to discriminate both mothers and fathers at risk of developing

postnatal depression at the general population level from those who do not. A WEMWBS cut-off of 48.5 (48/49 or  $\leq 48$ ) is recommended to screen postnatal depression in new-mothers. It corresponds to the two EPDS cut-off points (9.5 and 12.5) established for screening moderate to high likelihood to develop post-natal depression in mothers. This cut-off point produces a sensitivity percentage of 84.4% and a specificity percentage of 72.9%.

Our results do not allow us to recommend an optimal WEMWBS cut-off point for screening for postnatal depression in new-fathers. Further analyses in father samples are needed.

It might be underlined that the WEMWBS is a screening tool at the general population level and that scores below 48.5 during the postnatal period are solely indices of potential risk to develop a postnatal depression. Hence, in a context of primary care, conditions associated with WEMWBS scores below 48.5 in mothers should be confirmed as clinical or not clinical depression condition by means of appropriate diagnostic tools.

Further research on the WEMWBS sensitivity is required, such as studies relating to the WEMWBS predictor values and sensitivity to change.

All practitioners of public mental health and mental health promotion should recognise the importance of using measures of mental wellbeing to monitor the general population condition and evaluate programmes for improving mental health.

The WEMWBS is not prone to ceiling effects in general population levels (a limitation that instead concerns mental illness measures); it means it is able to show improvement in mental health in the healthier portion of the population distribution.

Lastly, it is positively worded and this characteristic produces an important impact in the evaluation that people make about them. If mental illness tools are used in the evaluation of interventions to promote positive mental health there is a

significant risk of generating in participants the implicit message that the initiatives are intended merely to support people with mental disorders.

To conclude, more research on wellbeing is needed, despite important results around the relationship between positive mental health and health emerged from the recent scientific literature (see chapters 1, 2 and 3). The current study contributes to a deeper understanding of mental well-being that is surely linked to the development and validation of positive mental health measurement scales.

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