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Research

Development and Application of the Motivation to Eat Healthy and Exercise During Pregnancy (MEEP Scale)

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Abstract

Objective

To develop and apply a theory-based scale for measuring motivation to eat healthily and exercise during pregnancy.

Setting

Outpatient maternity clinics and antenatal classes in a local hospital covering both rural and urban populations.

Participants

One hundred and ninety six (196) primigravida women.

Methods

The MEEP scale was developed through transcription and modification of a previous motivational measurement scale, based on expectancy value (E-V) theory. Subsequently, a 64-item scale was constructed and validated. Initial piloting (n=20) and application of the scale was undertaken in a convenience sample of 212 primigravida women with a valid sample of 196 for analysis. Principle components analysis (PCA) was performed to refine the scale and explore any underlying factors related to women's motivation.

Results

Construct validity was demonstrated in that the three components emerging from the dataset were consistent with the underlying concepts of expectancy value theory. Cronbach alpha values of >.7 for all the subscales demonstrated substantial internal consistency for the three components for both diet and physical activity variables.

Conclusions

This study provides support for the reliability and validity of the MEEP scale on initial application. Further development and testing of this scale is required to confirm the factor structure and determine whether the MEEP tool is valid and reliable when applied in different settings.

Keywords: Pregnancy; Diet; Exercise; Motivation; Obesity; Motivational Measurement scale.

Background

Pregnancy is often associated with changes in diet and physical activity levels. Physical Activity Levels (PAL) and diet quality are commonly reported to decrease during pregnancy [1,2]. As a result around a quarter of women in the UK gain more weight than recommended during pregnancy [3]. Excess gestational weight gain (GWG) is associated with an increased risk of post term delivery, macrosomia, postpartum weight retention and obesity later in life [3,4,5,6]. A healthy diet and regular physical activity are reported to be effective in preventing excess GWG and postpartum weight retention and may improve outcomes for both mother and baby [7,8,9]. Consequently, national guidelines for weight management before, during and after pregnancy recommended that all women (regardless of BMI) should be provided with advice on diet and exercise as part of routine education [10].

There are multiple theories of human motivation that could be used to explore the motivational impact of routine education on women's motivation to eat healthily and exercise during pregnancy. Expectancy-value theories [11], have been used to successfully explain women's intentions to exercise and eat healthily in [12,13,14]. An expectancy-value approach presumes that "people are motivated to engage in an activity if it is perceived to be linked to the satisfaction of personal needs and if there is a positive expectancy for success" [15]. In order for pregnant women to be motivated through routine instruction, health professionals must find the balance between communicating the *value* for that behaviour and supporting women's *expectancy to succeed* (confidence) in carrying out that behaviour.

As part of a larger study aiming to develop a motivational intervention for weight management in pregnancy, a new tool was developed for measuring women's Motivation to Eat healthily and Exercise during Pregnancy (MEEP scale). Currently, very little is

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known about whether existing antenatal education achieves the motivational balance between encouraging women to value diet and physical activity and increasing their expectancies to succeed (confidence) in carrying out these behaviours. Therefore, as part of a funded doctoral study, a literature review indicated that women's motivation to eat healthily and exercise during pregnancy was influenced by their beliefs, attitudes and confidence (16). No validated tool was found that measured pregnant women's motivation to engage in healthy behaviours was found. However, a tool developed to measure motivation in early postnatal women [17] was identified that incorporated four key theories that covered the motivational concepts identified above: task value [18], goal theory [19], self-efficacy theory [20] and attribution theory [11]. Therefore, the items from the postnatal tool were used as a basis to develop the MEEP tool.

Ethical approval to carry out the study was obtained by the Ulster University Ethics Committee and the Office for Research Ethics Northern Ireland [ref no. 11/NI/0106].

Aim

To develop and apply a theory-based tool for assessing motivation to eat healthily and exercise during pregnancy.

Methods

Step 1: Item Generation

Scale items were developed based on a review of the literature [15] and a previously developed motivational tool for postnatal women [17,21]. A total of 51 items were adapted from the original tool to a diet and physical activity context. Due to the nature of measuring two different behaviours (healthy eating and physical activity), the number of items included increased to 74 items. The wording of items was adapted to measure motivation in relation to both diet and physical activity. Items generated aimed to assess valence, self-efficacy, attribution and goals. Consideration was given to the approximate equal intervals between points in the rating scales. Although the original tool applied a 5-point likert scale, existing literature suggests that a 7-point likert scale has greater variability and higher overall reliability in comparison [22]. Responses were measured on a scale consisting of: absolutely agree, strongly agree, agree, not sure, disagree, strongly disagree and absolutely disagree.

Step 2: Expert Review

Five experts were asked to peer review the MEEP scale to ensure face and content validity before piloting. Experts included: a midwifery researcher, two health researchers, a motivational design expert and a clinical midwife. The panel were asked to comment on the clarity and readability of the questions and the suitability of items for the intended aim. A number of changes were suggested by the experts and after discussions within the research team several changes were made, mainly relating to the format of the tool and the deletion of items due to lack of clarity of meaning. This resulted in a reduction in items to a total of 64 scale items.

Step 3: Pilot Testing

Prototype one of the instrument (consisting of 64 items) was pilot tested within a convenience sample of 20 primigravida women. Women were recruited at the same maternity unit that would be used for validating the instrument in a larger sample to ensure similar characteristics. Inclusion criteria required the woman to be ≥18 year's old, ≥36 weeks gestation, fluent in English, receiving routine antenatal care low risk pregnancy defined by obstetricians and a singleton pregnancy. Women were excluded if they had a pre-existing medical condition or confirmed fetal anomaly. Midwives identified suitable participants at routine antenatal appointments and education classes within the chosen research site. Suitable participants were introduced to the researcher at the end of their consultation by the midwife and were provided with both written and verbal information about the study. Potential participants were given seven days to decide if they would like to take part in the study.

Feedback from the women who completed the pilot study indicated that they found the instrument clear and easy to complete. All women were able to complete the questionnaire in less than 30 minutes. No other changes were made to the questionnaire as result of the pilot study.

Step 4: Initial Testing of the MEEP Scale

Exploratory factor analysis (EFA) is a statistical technique often performed in the early stages of scale development where the processes underlying a specific subject area have not been previously identified. As the relationship between the theoretical concepts of valence, self-efficacy, attribution and goals had not been previously explored in relation to motivation for healthy eating and physical activity in pregnancy, EFA was used to reveal any underlying concepts or factors within the observed variables without imposing a preconceived structure on the outcome. Tabachnick and Fidell [23] recommend a sample size of 300 cases for Exploratory Factor Analysis (EFA). However, they do suggest that a smaller sample size of around 150 cases would be sufficient if a solution contains high factor loadings (≥.7).

Data Analysis

Data from the questionnaire was entered into the statistical package SPSS (version 17.0).

Principle component analysis (PCA) and factor analysis (FA) are different techniques but both tools used in EFA and often yield similar results. PCA was chosen based on the reasons outlined by Stevens [24] namely that it is a more psychometrically sound procedure and simpler mathematically. A critical value of ≥0.45 for factor loadings was implemented to ensure factor reliability [25]. Three different criteria were used to determine how many components to extract; Kaisers criterion, scree plot and parallel analysis.

Cronbach's alpha coefficient was computed to measure internal consistency. Analysis was performed on diet and physical activity variables separately. PCA was run with BMI classification as a selection variable to determine any differences in motivation between women with a normal BMI (18.5-25kg/m^2) and women with a high BMI i.e. overweight and obese (≥25 kg/m^2), as a means of obtaining construct validity [26].

Principal Components Analysis

Prior to performing PCA, the suitability of data for factor analysis was assessed in three different ways: The Kaiser-Meyer-Olkin value must exceed the recommended value of .6 [27], Barlett's Test of Sphericity [28] must reach statistical significance and correlation matrix was inspected for coefficients of .3. To aid in interpretation Direct Oblimin rotation was used.

Results

Sample Characteristics

Of the 196 participants included in the final dataset; 57% were classified as normal weight (18.50 - 24.99 kg/m^2), 16% overweight (25-29.99 kg/m^2), 25% obese (≥30 kg/m^2), and 2% underweight (≤18.49) [26] Participants were aged between 18 and 44 years and mean age was 29.57 years. In addition, 89% of women were in current employment and 11% were classified as unemployed. All participants completed the questionnaire within four weeks of giving birth.

Results in Relation to Diet

Kaiser's criterion identified 10 components with eigen values ≥1, accounting for 66.2% of variance explained. Initially, results from the scree plot and parallel analysis indicated a four factor solution. However, after inspection of the pattern matrix it was determined that component four was interpretable but not reliable according to guidelines by Guadagnoli and Velicer [29]. Therefore, a three component solution was forced, accounting for 47.7% of variance. After extraction of items with low communalities (<.3) total variance increased to 51.4%. All three components were considered interpretable and reliable. Component one reflected value for healthy eating, component two reflected a theme of relational support (midwife) and component three, expectancy for success. The three components and loadings for each variable are shown in Table 1. There was a moderate, negative correlation between the three components (r=-.386). The sampling adequacy of the model was high (KMO=0.912) and Bartlett's test of sphericity was significant (666, P<.000), indicating good model acceptability.

Physical Activity Items

Kaiser's criterion identified seven components with eigenvalues ≥1, accounting for 63.8% of variance explained. The scree plot revealed a break after the fourth component (indicating three components). Results from parallel analysis also identified three components. Therefore, a three component solution was forced, explaining 48.8% of variance. Removal of low communalities increased total variance to 54.5%. The same three components that emerged in relation to diet also emerged in relation to physical activity: component one reflected value for physical activity, components two reflected a theme of relational support (midwife) and component three, expectancy for success. The three components and loadings for each variable are shown in Table 2. There was a moderate, negative

	C1 Value	C2 Midwife Support	C3 Expectancy for Success
	Cumulative Variance Explained		
Variables	33.5%	11.3%	6.5%
It was worthwhile for me to eat healthy foods during pregnancy	.882	.026	.069
It was important to me to eat healthy food during my pregnancy	.830	-.043	.015
I would have been upset if I did not manage to eat healthy food during pregnancy	.813	-.100	.014
I felt a sense of well-being when I ate healthy during my pregnancy	.784	.031	.014
During my pregnancy I liked eating healthy foods	.747	.050	-.165
It was not that important to me if I ate healthy foods during my pregnancy	-.729	.043	.010
I felt a great sense of personal satisfaction when I ate healthy during my pregnancy	.690	.082	.223
My own feelings were generally not affected much one way or the other by how healthy I ate in my pregnancy	-.644	.037	-.283
During my pregnancy I hated eating healthy foods	-.633	-.084	.163
Generally speaking I am very satisfied with how healthy my diet was during my pregnancy	.632	.012	-.184
I regularly consumed fruit and vegetables as part of a healthy diet	.622	.051	-.235
During my pregnancy I included fruit and vegetables in my diet	.565	-.137	-.331
While I was pregnant I looked forward to eating healthy	.545	.067	-.052
It was very important to me that I knew how to work at reaching my healthy eating goal	.530	.309	-.018
During my pregnancy I included high fibre foods in my diet	.516	.011	-.315
I had considerable independence and freedom as to how I managed healthy eating during pregnancy	.515	.001	-.239
I always dealt well with the fact that eating healthy during pregnancy was more time consuming	.496	.115	-.159

I always made time to prepare healthy meals and snacks during pregnancy	.479	.127	-.355
I always had a good routine of eating healthy throughout my pregnancy	.475	.084	-.412
Overall I was no good at eating healthy while pregnant	-.410	.060	.238
I often consumed takeaway foods as my main meal of the day	-.391	.221	.369
I received lots of support and guidance from my midwives about healthy eating during my pregnancy	-.077	.833	.000
The information I received from the midwives told me what I needed to know about planning my diet for weight management during pregnancy	.006	.808	-.065
During my pregnancy, as a result of feedback from my midwives I knew that I was eating well	.092	.803	.202
I was encouraged by midwives to develop a healthy eating plan during my pregnancy	.119	.754	.074
The midwives let me know how well I was managing my weight during my pregnancy	.086	.677	.171
The feedback I got from my midwives as to how healthy my diet was during pregnancy was not very useful	-.022	-.568	.056
There are things I would have liked to have known about eating healthier in pregnancy that I wasn't told	.224	-.555	.333
I understood clearly what type of foods to eat to have a healthy diet	.133	.555	-.239
While I was pregnant I found nutrition to be confusing	.028	-.190	.761
It was too much effort to make healthy meals during my pregnancy	-.097	-.017	.735
During my pregnancy I didn't know how to cook healthy meals	-.160	.009	.692
While pregnant, I never had enough time to eat a healthy, balanced diet	-.349	.061	.610
While I was pregnant I found that eating healthy cost too much	.090	-.113	.554
There were obvious challenges that I needed to overcome to eat healthy	-.111	.192	.553
I was afraid to change my diet during pregnancy in case it was harmful to my baby	-.156	.024	.539
I found healthy foods unappetising during my pregnancy	-.379	.066	.447

Table 1: The three component solution of the MEEP tool Applied to First-Time Mothers in Relation to Diet.

Component loadings ≥.45 are shown in bold

	C1 Value	C2 Midwife Support	C3 Expectancy for Success
	Cumulative Variance Explained		
Variables	33.5%	11.3%	6.5%
I would have been upset if I did not manage to exercise during pregnancy	.889	-.009	.153
It was important to me to exercise during my pregnancy	.874	.011	.107
It was worthwhile for me to exercise during pregnancy	.845	.024	-.002
I felt a sense of well-being when I exercised during my pregnancy	.818	.111	-.010
It was not that important to me if I exercised during my pregnancy	-.810	.067	-.098
I felt a great sense of personal satisfaction when I exercised during my pregnancy	.768	.037	.097
During my pregnancy I liked exercising	.752	.112	-.237
I always made time to exercise during pregnancy	.724	.101	-.172
My opinion of myself went up when I exercised during pregnancy	.683	-.036	.111
While I was pregnant I looked forward to exercising	.657	.106	-.213
During my pregnancy I hated exercising	-.568	.014	.297
I always had a good routine of exercising throughout my pregnancy	.554	.111	-.385
Rest and relaxation were more important during my pregnancy than having regular exercise	-.515	.026	.121
I found it was too much effort to exercise during my pregnancy	-.499	.071	.482
It was very important to me that I knew how to work at reaching my exercise goal	.493	.247	-.024
Overall I was no good at exercising while pregnant	-.467	.237	.457
During my pregnancy I couldn't find time to exercise	-.440	.053	.296
During my pregnancy, as a result of feedback from my midwives I knew that I was exercising well	.059	.804	.130
The information I received from the midwives told me what I needed to know about including physical activity in my daily routine for weight management during pregnancy	-.063	.802	.027
Following the first discussion with my midwife , I had a clear exercising goal in mind	.136	.775	.045
The midwives let me know how well I was managing my weight during my pregnancy	.106	.695	.148
I was encouraged by midwives to exercise during pregnancy	.150	.687	.099
I understood clearly how much and how often I as an individual should have been exercising during my pregnancy	.067	.667	-.168
The feedback I got from my midwives as to how well I was exercising during pregnancy was not very useful	.126	-.566	.111
There are things I would have liked to have known about how I could exercise in pregnancy that I wasn't told	.466	-.527	.368
There were obvious challenges that I needed to overcome to exercise successfully	.100	.164	.690
I often felt uncomfortable or sore when exercising during my pregnancy	-.097	.037	.670
I was unsure about what exercises were safe and beneficial to do during my pregnancy	.024	-.196	.627
I always successfully coped with exercising during pregnancy like I have at other times in my life	.313	.169	-.481
Generally speaking I am very satisfied with the amount of exercise I did while pregnant	.414	.132	-.475
I had considerable independence and freedom as to how I managed exercising during pregnancy	.249	.085	-.388

Table 2: Three components Solution of the MEEP Tool Applied to First –Time in Relation to Physical

correlation between the three components (r=-.304). The sampling adequacy of the model was high (KMO=0.898) and Bartlett's test of sphericity was significant (465, P<.000), indicating good model acceptability.

Validity and Reliability of PCA Output

Construct validity was demonstrated in that the three, independent components emerging from the dataset were consistent with the underlying concepts of expectancy value theory.

Internal Consistency

Cronbach alpha values of >.7 for all the subscales demonstrated substantial internal consistency for the three components for both diet and physical activity variables (see table 3 below).

Component/ subgroups	Normal weight		Overweight and Obese	
	Diet	*Physical activity*	*Diet*	*Physical activity*
Value	.910	.912	.897	.940
Midwife support	.850	.849	.855	.850
Expectancy for Success	.871	.759	.885	.704

Table 3: Cronbach Alpha Values for Subscales Showing Good Internal Consistency and Reliability

Discussion

This study describes the development and initial testing of the MEEP scale, which was developed as a diagnostic tool to measure women's motivation (in terms of value and expectancy for success) in relation to eating healthily and exercising during pregnancy. The scale was developed from a previous tool [17, 21]. After transcribing appropriate items into a diet and physical activity context, expert review confirmed face and content validity and the clarity and meaning of the suggested scale. Although the scale incorporated 4 different motivational theories, analysis of 196 complete datasets revealed a three factor solution in accordance with the underlying concepts of expectancy-value theory: value for the behaviour, relational support (midwife) and expectancy for success. High internal consistency and reliability was demonstrated for each of the subscales in relation to high cronbach alpha correlations (α=>.7) for both diet and exercise variables.

The Theoretical Importance of the Resulting Factor Structure

Outcomes of PCA suggest that the value pregnant women place on behaviour will strongly influence their motivation to carry out that behaviour. PCA output suggested a high value for diet and physical activity behaviour (indicated by high loadings on the value component). The idea that first-time mothers place a high value on healthy diet and physical activity behaviour during pregnancy is not novel. Exploratory studies have shown that the majority of pregnant women believe that physical activity would have a positive impact on their pregnancy and they recognise the link between diet and the health of mother and baby [2,30,31]. In fact, as pregnancy is often thought of as a 'teachable moment', the risk associated with the health of mother and baby can enhance the perceived value of healthy eating and physical activity [32,33].

These findings are consistent with the underlying assumptions of expectancy-value theory and are supported by previous research reporting overweight and obese women to be high risk for long term retention of gestational weight gain due to poor diet quality and low physical activity [34,1]. When women's value for diet and exercise behaviour is high but their expectancy for success is low, their satisfaction is negatively affected and the result is likely to be distress and anxiety. In order for women to address this balance they have to find a new way to improve their confidence or alternatively lower the value they place on the behaviour [35].

Theorists agree that motivation remains complex and can only be understood through different theoretical lenses; for example, the person's perceived 'self-efficacy' [36,37] and how they psychologically attribute their successes and failures [38].

Low expectancy for success in relation to diet and physical activity during pregnancy has been highlighted in other studies. Literature suggests that obese individuals often experience lower self-efficacy in relation to diet and exercise behaviours compared to normal weight individuals [39,40]. Overweight and obese women often face different motivational barriers to normal weight women and so may require more intense interventions for weight management during pregnancy [41]. Previous research has shown that higher levels of diet and exercise related self-efficacy has been associated with helping women overcome barriers and improve health behaviours in pregnancy [42,43].

Limitations

Although the MEEP scale has demonstrated validity and reliability, further research is needed to confirm the factor structure and determine whether the MEEP scale is valid and reliable when applied in different settings. Therefore, the shortened version of the above scale should undergo confirmatory factor analysis to verify the factor structure in a larger sample to strengthen rigour and determine further construct validity.

Conclusion

This study provides support for the reliability and validity of the MEEP scale on initial application.

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