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A prospective longitudinal study testing relationships between meaningful activities, basic psychological needs fulfillment, and meaning in life

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Abstract

The present study employed a prospective longitudinal design to determine if change in meaningful activity over an 11-month period could help to explain change in meaning in life in a sample of 174 undergraduate and graduate students. The Engagement in Meaningful Activities Survey, Basic Psychological Needs Scales (i.e., autonomy, competence, and relatedness), and the Meaning in Life Questionnaire were used as indicators of the constructs of meaningful activity, basic psychological needs fulfillment and meaning and purpose in life. The findings were in support of the study hypotheses and indicated that change in meaningful activity explained both change in basic psychological needs fulfillment (i.e., autonomy, competence, and relatedness) and change in meaning in life. Further, this study reports findings consistent with results from cross-sectional studies in support of the hypothesis that change in meaningful activity may influence change in meaning in life through two pathways: a direct path of influence from meaningful activity to meaning in life and an indirect path through change in basic psychological needs fulfillment. The present study contributes to a growing literature implicating subjective evaluations of day-to-day action (or meaningful activity) as a fruitful means for exploring relationships between occupation and well-being.

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Introduction

The concept of meaningful activity has been viewed as an essential means through which to explore relationships between occupation and well-being. The subjective quality of experience or meaning associated with engagement in activity may be a key mechanism through which day-to-day action influences personal well-being, such as meaning in life (Townsend & Polatajko, 2007; Wilcock, 2006; Yerxa et al., 1990). Further, models within occupational science and occupational therapy incorporate subjective experience as central to our understanding of the role of human action or doing in the formation of life meaning (Eakman, 2013a; Persson, Erlandsson, Eklund, & Iwarsson, 2001). Ultimately, meaning in life constitutes a key outcome of human health and well-being and discerning which factors enrich its presence within our lives constitutes a worthy and much needed endeavor (Roepke, Jayawickreme, & Riffle, 2013; Ryff & Singer, 1998; Wong, 2012).

Recent theoretical development and empirical study on these concepts has been occurring including the validation of measures of meaningful activity. Much of this research has involved cross-sectional studies which have supported the presence of important relationships between meaningful activity and meaning in life (e.g., Eakman, Carlson, & Clark, 2010a; Eakman & Eklund, 2012). Nonetheless, research methods such as longitudinal and experimental designs are needed to further develop our understanding of feasible causal relationships amongst these concepts (Finkel, 1995; Hayes, 2013). The present prospective longitudinal design study was undertaken to determine if, over time, change in meaningful activity could predict change in meaning in life. This study also sought to test if basic psychological needs fulfillment might play

a role in the relationship between these concepts, thereby adding to our understanding of mechanisms through which meaningful activity may influence life meaning.

Background

The concept of meaningful activity can be defined as generally positive subjective experiences, composed of a breadth of unique and identifiable aspects, that are associated with human action or doing (Eakman, 2013b; Hammell, 2009; Leufstadius, Erlasnnson, Björkman, & Eklund, 2008). This perspective is consistent with occupational therapy and occupational science definitions which implicate subjective qualities associated with day-to-day action such as importance or personal significance as reflecting meaningful activity (Christiansen & Baum, 1997; Kielhofner, 1985). Recent empirical and theoretical work extend this understanding and include diverse aspects of subjective experience as comprising meaningful activity such as pleasure and enjoyment, social connectedness and competent completion of tasks (Persson et al., 2001), expressing creativity, feeling valued by others, being in control, and a sense of satisfaction arising from day-to-day action (Eakman, 2012; Goldberg, Brintnell, & Goldberg, 2002). Further, meaningful activity may indeed serve an instrumental role in fostering well-being and contributing to a sense of meaning in life through meeting human needs such as being, becoming, and belonging (Doble & Santha, 2008; Hammell, 2009; Rebeiro, Day, Semeniuk, O'Brien, & Wilson, 2001; Wilcock, 2006).

The Meaningful Activity and Life Meaning (MALM) model was recently proffered in an attempt to explain the relationships between meaningful activity, human needs fulfillment and meaning in life (Eakman, 2013b). The Figure offers a visual representation of the MALM model in which meaningful activity is purported to have a direct causal role in fulfilling basic

psychological needs (e.g., Ryan & Deci, 2000) and contributing to a sense of meaning and purpose in life. Further, the relationship between meaningful activity and meaning in life likely

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occurs through two pathways according to the MALM model. The first is the direct effect of meaningful activity upon meaning in life, and the second path is an indirect effect of meaningful activity upon meaning in life as mediated through basic psychological needs fulfillment.

Meaningful activity is conceived within the MALM model as having a direct and supportive influence upon meaning in life; a proposition supported by literature within a number of disciplines. Reker (2000), for example, has asserted that existential or life meaning may be defined as, "...the cognizance of order, coherence, and purpose in one's existence, the pursuit and attainment of worthwhile goals, and an accompanying sense of fulfillment" (p. 41).

Additional perspectives on meaning in life view personal values and beliefs as underlying personal action in the pursuit of valued goals which when satisfactorily achieved contribute to a sense of life meaning and purpose (e.g., Baumeister, 1991; Klinger, 2012; Reker & Wong, 1988). These accounts therefore acknowledge the critical role meaningful activity may serve in constituting and supporting human development and contributing to a sense of meaning and purpose in life.

Occupations (or day-to-day activities) can be viewed as being motivated by personal values and beliefs and serve as behavioral extensions of our valued goals (Christiansen, 1994; Eakman, in press; Emmons, 1999; Kielhofner, 1985; Little, 1998). Contextualized within the vicissitudes of our day-to-day lives, occupation may serve to support human needs fulfillment thereby fostering development, health, and well-being (Hammell, 2004; Rebeiro et al., 2001; Wilcock, 2006; Yerxa et al., 1990). Meaningful activity, according to the MALM model, should

therefore influence the development of meaning in life via two avenues. The first path being a direct effect upon meaning in life, whereas the second path should be the fulfillment of human needs which in turn are supportive of meaning in life.

Recent research in occupational science has begun to confirm cross-sectional relationships between meaningful activities, basic psychological needs fulfillment (i.e., autonomy, competence and relatedness) and meaning in life. Studies employing the Engagement in Meaningful Activities Survey (EMAS) have established moderate positive associations between meaningful activity and measures of meaning and purpose in life in older adults with and without disabilities, undergraduate and graduate college students (Eakman, 2011, 2013a; Eakman et al., 2010a; Eakman, Carlson, & Clark, 2010b; Eakman & Eklund, 2012). Positive associations have also been found amongst meaningful activity and basic psychological needs fulfillment including indicators of autonomy, competence and relatedness (Eakman, 2011, 2013a). Cross-sectional studies using the Occupational Value Assessment with predefined items which assesses occupational value, a construct quite similar to meaningful activity, have also demonstrated positive relationships with measures of well-being including meaning in life (Eakman & Eklund, 2012; Eklund, Erlandsson, & Persson, 2003; Erlandsson, Eklund, & Persson, 2011).

A test of the MALM model was recently conducted in a sample of 591 undergraduate and graduate students and the findings were in support of the hypotheses derived from the model including positive relationships amongst meaningful activity, basic psychological needs fulfillment and meaning in life (Eakman, 2013b). That study found that meaningful activity explained both basic human needs fulfillment and meaning in life. The results of a latent variable path model indicated that the effects of meaningful activity upon meaning in life may occur via

two pathways: a direct effect of meaningful activity upon meaning in life and an indirect or partially mediated path through basic psychological needs fulfillment (see Figure).

Researchers, however, have also found consistent relationships between depression, and the constructs represented within the MALM model. For example, the thwarting of basic psychological needs fulfillment has been associated with increased negative affect and depression (Deci & Ryan, 1990, 2008b; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). Within the study of life meaning and purpose, consistent negative associations with depression have been noted suggesting an increased risk for depressive symptomology when individuals fail to find adequate meaning within their lives (Klinger, 1977; Steger, Frazier, Oishi, & Kaler, 2006; Zika & Chamberlain, 1992). As well, negative affect and depressive symptoms appear to be negatively associated with the positive subjective experiences found within meaningful activity (Argentzell, Leufstadius, & Eklund, 2012; Eakman, 2011; Eakman et al., 2010a; Eklund & Leufstadius, 2007). Together these reports implicate depression as a factor of interest in the study of temporal relationships between meaningful activity and meaning in life.

To date only cross-sectional designs have been employed to assess relationships amongst meaningful activity, basic psychological needs and meaning in life. Cross-sectional data lie at one end of a causal inference continuum, exceeded in capacity for causal inference by longitudinal designs, and bounded at the other end by data from randomized-controlled experiments (Frazier, Tix, & Barron, 2004). Longitudinal data offer an improvement in causal inference over cross-sectional data affording researchers the capacity to describe and analyze patterns of change by estimating relationships between variables across at least two points in time. That is, determining that change in one variable (e.g., meaningful activity) is related to

change in another variable (e.g., meaning in life) enhances the feasibility of causal assertions amongst variables when compared to cross-sectional designs (Finkel, 1995).

Cross-sectional data are useful for describing patterns of relationships amongst variables that exist at one point in time, yet these data cannot serve as the sole means for modeling dynamic causal relationships. MacKinnon (2008) suggests the study of change processes must rely upon substantive theory when investigating complex mechanisms of change, and researchers should endeavor to explore feasible process of mediation. Briefly, mediation refers to the idea that a causal relationship between two variables may occur, in part, through an intermediary process or variable (Baron & Kenny, 1986; MacKinnon, Fairchild, & Fritz, 2007). A common approach in this area of study adopts a change score, e.g., variable at time 2 (t2) minus variable at time 1 (t1), to explore relationship amongst variables overtime. Hypothesized causal mechanism of change, therefore, may be more rigorously explored by employing a longitudinal design study (Menard, 2002; Singer & Willett, 2003). This approach was used within the present study to explore the temporal relationships between meaningful activity, basic psychological needs fulfillment, and meaning in life.

Study Hypotheses

The relationships between meaningful activity, basic psychological needs fulfillment and meaning in life were explored within the present study; data were collected at two time points nearly one year apart. It was hypothesized that change in meaningful activity over time will explain change in meaning in life; subsidiary hypotheses include: a) change in meaningful activity will explain change in basic psychological needs fulfillment, b) change in basic psychological needs fulfillment will explain change in meaning in life, and c) change in

meaningful activity will explain change in meaning in life directly and indirectly as mediated through change in basic psychological needs fulfillment.

Method

Testing Procedures and Participants

This was a prospective longitudinal panel study of two time periods with a multiple-year, multiple cohort design (Menard, 2002). Participants were undergraduate and graduate students enrolled at a mid-sized Mountain West University in the United States between March 2009 and January 2011 and were part of two related studies approved by the XXX Human Subjects Committee. Participants had to be enrolled at the University and be 18 years of age or older to be included in the studies; there were no exclusion criteria. Personalized email invitations were sent to randomly selected students, followed by two reminder emails sent within a one-week timeframe. Participants were provided a link to a web-based survey hosted by SurveyMonkey and informed consent was established by participants indicating they understood the informed consent materials and agreeing to complete the study.

Data for this study were drawn from two cohorts: cohort one at time one (t1; March 2009; $n = 122$) and time two (t2; January 2010; $n = 53$), and cohort two at t1 (January 2010; $n = 223$) and t2 (January 2011; $n = 121$). Therefore, an $N = 345$ was established for participants completing assessments at t1 (response rate for t1 participants was 20.1%) and an $N = 174$ for participants who also completed assessments at t2 (response rate of 49.6% of t1 participants). Time frames between t1 and t2 were approximately 40 weeks for cohort one and 46 weeks for cohort two with a sample size-adjusted mean timeframe of 44 weeks or 11 months. Participants at t1 were on average 29.9 years of age ($mdn = 27$; range 18-59); 59.5% were female and 54.4% were not married. There was a majority of undergraduate students (72.5%) compared to graduate

students and a large majority of the sample was Caucasian (86.1%). The next largest racial/ethnic representations within the sample were Hispanic/Latino (5.5%) and Asian (4.3%).

Measures

Engagement in Meaningful Activities Survey (EMAS). The EMAS (Goldberg et al., 2002) is a 12-item survey which incorporates a breadth of items reflecting the construct of meaningful activity. Each of the 12 EMAS items begins with, “The activities I do...” and include respectively: help me take care of myself, reflect the kind of person I am, express my creativity, help me achieve something which gives me a sense of accomplishment, contribute to my feeling competent, are valued by other people, help other people, give me pleasure, give me a feeling of control, help me express my personal values, give me a sense of satisfaction, and have just the right amount of challenge. EMAS test-retest reliability ($r = .81$) and internal consistency reliability ($\alpha = .88$) have been good, and the scale demonstrates very good convergent and predictive validity (Eakman, 2011; Eakman & Eklund, 2012). Respondents rated each EMAS item on a 5-point scale which included 1 (never), 2 (rarely), 3 (sometimes), 4 (usually), and 5 (always) which were subsequently recoded (1 = 1, 2 = 1, 3 = 2, 4 = 3, 5 = 4) for data analyses to enhance measurement precision as recommended by Eakman (2012).

Basic Psychological Needs Scale (BPNS). The BPNS is comprised of three subscales that assess the constructs of autonomy, competence and relatedness proposed by Deci & Ryan (2002; Ryan, 1995). Examples of items reflecting each of the three basic psychological needs include: Autonomy - “I feel like I am free to decide for myself how to live my life,” “I generally feel free to express my ideas and opinions,” Competence - “I have been able to learn interesting new skills recently,” “Most days I feel a sense of accomplishment from what I do,” and Relatedness - “I really like the people I interact with,” and “People in my life care about me.” The BPNS subscales have been shown to have adequate psychometric properties including

internal consistency reliability and construct validity (Eakman, 2011; Gagne, 2003; Kashdan, Julian, Merritt, & Uswatte, 2006). The subscales consist of seven, six, and eight items respectively and respondents rated each item on a 7-point scale from 1 (not at all true) to 7 (very true); the BPNS subscale scores were generated according to the published algorithm (Deci & Ryan, 2008a).

Meaning in Life Questionnaire (MILQ). The MILQ is a 10-item scale that assesses both the presence of meaning in life and the search for meaning in life. For this study only the Presence subscale (MILQ) was used for data analysis. The MILQ comprises five items that assesses meaning in life defined as the sense made of, and significance felt, regarding the nature of one's being and existence (Steger et al., 2006). Examples of MILQ items include: "I understand my life's meaning," "My life has a clear sense of purpose," and "I have a good sense of what makes my life meaningful." The items comprising the MILQ have been shown to assess a unidimensional life meaning construct and the scale demonstrates good test-retest reliability ($r = .86$) and good internal consistency ($\alpha = .86$). Respondents rated each of the five MILQ items on a 7-point scale from 1 (absolutely untrue) to 7 (absolutely true); MILQ scores were generated according to the published algorithm (Steger et al.).

Depression subscale of the Depression, Anxiety and Stress Scales (DASS-D). The depression subscale of the DASS-21 is a 7-item short-form of the DASS. The DASS-21 contains three seven-item subscales validated to measure depression (DASS-D), anxiety and stress respectively (Henry & Crawford, 2005). An indicator of depression was included within the present study due to it having both theoretical and empirical relationships with meaningful activity, basic psychological needs fulfillment and meaning in life (Eakman, 2011, 2013a; King & Hicks, 2012; Klinger, 2012; Steger et al., 2006; Weinstein, Ryan, & Deci, 2012). For the

present study, the DASS-D was used as a measure of depression. The DASS-D uses a 4-point scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). The DASS-D score was generated according to the published algorithm (Henry & Crawford).

Data Analyses

Testing for Cohort Equivalence

Participant attrition is a concern within longitudinal studies because it may influence the pattern of association amongst variables (Menard, 2002), therefore the present study employed a thorough evaluation of cohort equivalence. Those who completed only t1 assessments (leavers) were compared with those completing both t1 and t2 assessments (stayers) in terms of demographic data by conducting a *t*-test for age and chi-square tests for gender and marital status. Mean levels of other study variables (i.e., DASS-D, EMAS, BPNS subscales, and MILQ) were evaluated comparing the t1 data of leavers and stayers using *t*-tests. Significant differences in these indicators between leavers and stayers could be indicative of an attrition affect (Menard, 2002); an a priori significance level of .05 was set for these analyses.

Three separate regression models were then evaluated with t1 data to determine if the prediction of MILQ differed between leavers and stayers; an attrition dummy variable was generated and included in the models. Each model then contained the following variables: age, gender, marital status, cohort (i.e., cohort one [2009-2010], cohort two [2010-2011]), DASS-D, and EMAS. The three models included respectively the BPNS-Autonomy, BPNS-Competence or BPNS-Relatedness subscale. A statistically significant attrition variable coefficient ($p < .05$) within any of the three models would suggest an attrition effect in the prediction of MILQ in the t1 data.

Prediction of Change in Meaning in Life

Scale reliability, zero-order correlations, and time 1 and time 2 regression models.

Internal consistency reliabilities (Cronbach's alpha) were calculated for each measure at t1.

Zero-order Pearson's correlations were calculated between study variables for t1 and t2 including DASS-D, BPNS subscales, EMAS, and MILQ. Correlation coefficients amongst t1 and t2 scores were used to provide 11-month temporal stability estimates of the respective scales. Pearson's correlations were run for the t2-t1 change variables and three additional regression models were generated for the t2 data to compare with the t1 regression models noted immediately above in testing for cohort equivalence. In these models t2 MILQ was regressed on: age, gender, marital status, cohort, and the t2 variables of DASS-D, the three respective BPNS subscales, and EMAS. Adjusted model *R*-square and standardized beta values were evaluated and similarities across models served as an indication of the relative stability of associations amongst variables overtime (Menard, 2002).

Regression models predicting change in meaning in life (t2-t1).

Change score variables were calculated for the DASS-D, EMAS, PBNS subscales, and MILQ to reflect change in these variables from t1 to t2. Change scores were calculated by subtracting t1 values from t2 values (i.e., $t2 - t1$). In each model MILQ (t2-t1) was regressed on the following variables: age, gender, marital status, cohort, DASS-D (t2-t1), and EMAS (t2-t1). The three models contained, respectively: BPNS-Autonomy (t2-t1), BPNS-Competence (t2-t1), and BPNS-Relatedness (t2-t1) to explore for variations in relationships between meaningful activity and meaning in life. All analyses were completed with IBM/SPSS version 20.0.0 (IBM/SPSS, 2011).

Testing the mediating effects of basic psychological needs fulfillment on meaning in life. As proposed by Eakman (2013b) meaningful activity may influence meaning in life directly, and indirectly as mediated through psychological needs fulfillment (see Figure). To test this hypothesis the SPSS Statistics Basic Script Editor version 21.0.0.0 (Hayes, 2008), based upon Preacher and Hayes' (2008) analysis of direct and indirect effects within mediation models, was used in the three regression models that included the t2-t1 change variables. Each model was identical to those predicting change in meaning in life found immediately above.

The Hayes (2008) program estimates the size and statistical significance of direct path effects (i.e., EMAS to BPNS, EMAS to MILQ, and BPNS to MILQ), total path effects (i.e., EMAS to MILQ) and provides estimates of indirect or mediated path effects (i.e., EMAS through BPNS to MILQ) along with 95% confidence intervals. From these analyses, the hypotheses of meaningful activity change predicting basic psychological needs fulfillment change, and basic psychological needs fulfillment change predicting meaning in life change can be tested. Importantly, the hypothesis that meaningful activity change will explain meaning in life change directly as well as indirectly as mediated through basic psychological needs fulfillment change will also be assessed. The ratio of the indirect path to total effect was calculated to provide an indicator of the size of the mediated effect within each regression model (MacKinnon, 2008).

Results

Testing for Cohort Equivalence

The presence of attrition bias was not of significant concern for this study. There were no significant differences found in demographic characteristics (i.e., age, gender, and marital status) between persons completing only t1 surveys (leavers) and those completing both t1 and t2 surveys (stayers). There were no statistically significant differences between leavers and stayers

for DASS-D, EMAS, BPNS subscales or MILQ. Finally, the attrition variable was not significant in any of the three t1 regression models predicting MILQ (Autonomy model: $\beta = -.05$, $t = -1.06$, $p = .29$, Competence model: $\beta = -.05$, $t = -1.13$, $p = .26$, and Relatedness model: $\beta = -.05$, $t = -1.14$, $p = .26$).

Scale Reliability, Zero-Order Correlations, and Time 1 and Time 2 Regression Models

Table 1 contains information related to t1 and t2 DASS-D, EMAS, BPNS subscales and MILQ scores. Internal consistency reliabilities were good to very good for the t1 DASS-D, EMAS, BPNS subscales and MILQ scores (mean $\alpha = .83$; range .71 to .90). The eleven-month stability coefficient for each variable from t1 to t2 was found to be in the moderate range: DASS-D = .40, EMAS = .57, BPNS-A = .62, BPNS-C = .54, BPNS-R = .58, and MILQ = .56.

A depression variable was included in the study to control for possible spurious relationships amongst the key study variables. DASS-D at t1 was moderately correlated with t1 EMAS, BPNS subscales and MILQ (mean $|r| = .50$; range $|.42|$ to $|.55|$), a similar pattern was found between DASS-D at t2 and t2 EMAS, BPNS subscales and MILQ (mean $|r| = .43$; range $|.31|$ to $|.53|$) suggesting similarities in the cross-sectional relationships between depression and the constructs of meaningful activity, basic psychological needs fulfillment and meaning in life in the present sample.

Regression models predicting t1 and t2 MILQ were also found to be similar suggesting relationships amongst the variables in the present samples were relatively stable over time; see Table 2. The mean adjusted R -square values for the three t1 models was .26, and modestly higher for the three t2 models at .35 with all F values significant at $p < .001$. Commonalities across models were most notable when evaluating the standardized betas in which depression, basic psychological needs fulfillment and meaningful activity were statistically significant

predictors of meaning life; Table 2 offers a summary of the standardized betas for each model. The EMAS followed by DASS-D were the more substantial predictors of MILQ regardless of timeframe or type of basic psychological need. The BPNS subscales held less substantial standardized beta weights. Being married was associated with higher levels of meaning in life in four of the six models, whereas neither age, gender or cohort were significant in any model.

Table 3 provides zero-order correlation coefficients amongst the t2-t1 change variables. Each correlation was in the low to moderate range indicating meaningful relationships amongst all change variables; though relationships with both depression change and meaning in life change were lower, on average, than within the t1 or t2 correlations found in Table 1.

Regression Models Predicting Change in Meaning in Life

Results from the regression models involving the t2-t1 change variables were in support of the study's main hypothesis that change in meaningful activity would help to explain change in meaning in life (see Table 4). A consistent pattern emerged in which meaningful activity change and basic psychological needs fulfillment change explained change in meaning in life. Alternatively, change in depression, cohort assignment, and the demographic variables failed to explain change in meaning in life in any of the three regression models. The adjusted *R*-square values in these models, though significant, were lower than those in either cross-sectional model (i.e., t1 or t2; see Table 2), perhaps reflecting an increase in measurement error associated with longitudinally designed studies (Menard, 2002).

Testing the Mediating Effects of Basic Psychological Needs Fulfillment on Meaning in Life

The hypothesis that change in meaningful activity would have a direct association with change in meaning in life in addition to an indirect (partially mediated) relationship through change in basic psychological needs was supported. To test this hypothesis, Preacher and Hayes'

(2008) analytic approach to assessing direct and indirect effects within mediation models was employed. Findings indicated that meaningful activity change was associated with change in each of the three basic psychological needs (a path in Table 5) and change in meaning in life (c' path in Table 5). In each of the three regression models the relationship between change in meaningful activity and change in meaning in life was partially mediated through basic psychological needs fulfillment change.

The indirect effects of EMAS change (i.e., through BPNS subscale change) upon MILQ change are indicated in Table 5 as the 'ab' paths. The range of the 95% confidence interval should include the value of the ab path and not fall below zero to interpret a statistically significant mediation effect (MacKinnon, 2008); this was the case in each model: BPNS-Autonomy ab path = .10, 95% CI = .03 - .20, BPNS-Competence ab path = .10, 95% CI = .02 - .24, and BPNS-Relatedness ab path = .08, 95% CI = .02 - .23.

The size of the mediated effect for both the BPNS-Autonomy and BPNS-Competence models was .39. Stated differently, nearly 40% of the variance in meaningful activity change upon meaning in life change was accounted for through change in autonomy and competence fulfillment. With respect to BPNS-Relatedness, change in this basic psychological need accounted for nearly one-third (31%) of the relationship between meaningful activity change and meaning in life change over the 11-month timeframe. Finally, depression change failed to achieve statistical significance as a covariate within mediation analyses despite moderate cross-sectional correlations at t1 and t2 with other study variables.

Discussion

Fostering well-being is a central concern of the occupational therapy profession. Within this concern, meaning in life has been identified as an indispensable component of well-being and a key outcome of occupational therapy practice. It is therefore of great importance to elucidate

mechanisms through which persons' day-to-day activities, the cornerstone of occupation-based practice, might influence well-being. The present study has contributed to this understanding by testing a tenet of the MALM model (see Figure) in which meaningful activity is purported to positively influence perceptions of meaning in life. Findings substantiate and extend prior research by demonstrating that changes in meaningful activity over time are likely related to changes in meaning in life. The following discussion will briefly summarize the present findings in the context of the MALM model and suggest future directions for research.

This study has demonstrated that change in meaningful activity over time independently explains change in meaning in life in the present sample, while accounting for change in depression and human needs fulfillment. This finding is important for a number of key reasons. Firstly, this study extends findings from cross-sectional data by demonstrating that associations between meaningful activity and meaning in life persist when accounting for the passage of time. As suggested by Menard (2002) the building of evidence in support of hypothesized causal mechanisms requires researchers to move beyond cross-sectional designs and adopt methods which may more rigorously test causal hypotheses. One aspect of Menard's perspective on causality in longitudinal studies is that non-zero relationships should exist between variables - a finding which was clearly demonstrated within the present findings between change in meaningful activities and change in meaning in life.

Secondly, Menard (2002) had suggested that strengthening claims regarding causality in longitudinal studies requires accounting for potentially spurious relationships amongst variables of interest. An indicator of depression was adopted to attempt to address this concern within the present study. Importantly, change in meaningful activity persisted as an independent predictor of change in meaning in life while controlling for changes in both depression and basic

psychological needs fulfillment. With respect to depression, the cross-sectional findings from the present study confirm existing research in which depressive symptomology has been negatively associated with these constructs (e.g., Eakman, 2011; Pinquart, 2002). Change in depression did not emerge as an independent predictor of change in meaning in life when controlling for changes in meaningful activities and basic psychological needs, however, offering longitudinal results which stand in contrast to existing cross-sectional research. It may be that in the present sample, changes in meaningful activities and basic needs fulfillment fully mediated the relationship between depression change and meaning in life change. This proposition was not tested in the present study and future research is warranted to address this interesting finding.

Results clearly indicated that changes in both meaningful activity and basic psychological needs fulfillment independently explained change in meaning in life across an 11 month period. This finding confirms present theoretical positions which conceptualize day-to-day action as having the potential for fulfilling human needs which together serve as critical factors supporting development, health, and well-being (e.g. Rebeiro et al., 2001; Wilcock, 2006). For example, the need for becoming through doing posited by Wilcock resonates well with the Self Determination Theory (SDT) concepts of autonomy (i.e., having authorship and choice over personal action) as well as competence (i.e., having skills needed to accomplish personal goals) which have been identified as basic psychological needs essential for fostering human development and contributing to a sense of meaning in life (Weinstein et al., 2012). Furthermore, belonging needs as advocated by Rebeiro et al. and Hammell (2004) seem synonymous with the SDT concept of relatedness which refers to the inherent need of feeling close and connected to others in the world, which when fulfilled, contributes to personal development and well-being (Ryan & Deci, 2002).

Path analyses results indicated change in meaningful activity independently explained changes in both basic psychological needs fulfillment and meaning in life; as well, basic psychological needs were found to partially mediate the relationship between meaningful activity and meaning in life. In support of the hypothesis arising from the MALM model, the influence of meaningful activity upon meaning in life may operate directly as well as indirectly through basic psychological needs fulfillment. Within each of the three regression models tested, the indirect effect of change in meaningful activity through change in psychological needs fulfillment (i.e., autonomy, competence, and relatedness) to change in meaning in life was significant and accounted for between 31-40% of the total variance in meaningful activity change explaining meaning in life change. This level of indirect effect through basic psychological needs is somewhat less than the 58% obtained by Eakman (2013b) in a cross-section study employing structural equation modeling with latent variables. It is not clear if the lower ratio of a mediated effect found in the present study is reflective of increased measurement error associated longitudinal designs, or alternatively, is a more likely estimate of mediation as these variables co-vary overtime. Nonetheless, there is emerging evidence that meaningful activity may likely play a pivotal role both in supporting human needs fulfillment and contributing to meaning in life.

Implications and Limitations

The idea of human needs fulfillment as a factor underlying perceptions of meaning associated with occupation is not new to occupational therapy. Perspectives adopting needs fulfillment as a conceptual tool for understanding the impact of participation (or occupation) upon well-being continue to proliferate with ideas such as being, becoming and belonging, life balance (Christiansen, Matuska, Polatajko, & Davis, 2009), occupational needs (Doble & Santha,

2008), and Lifestyle Redesign[®] (Jackson, Carlson, Mandel, Zemke, & Clark, 1998). Within each of these perspectives, the subjective qualities of experience associated with doing (e.g., meaningful activity) are inferred as being sensitive to the fulfillment of these needs and thereby can positively influencing well-being. Alternatively, failing to meet basic human needs, such as when opportunities to develop and express personal capacities through day-to-day action are thwarted, has been viewed as posing undue risk to optimal development, health, and well-being (e.g., Wilcock, 2006). Future research should therefore consider the idea of human needs fulfillment as a fruitful avenue for exploring the relationships between occupation and well-being.

This study adopted the Engagement in Meaningful Activities Survey (EMAS) as an indicator of meaningful activity which, given the present results, appears sensitive to change overtime. Researchers might consider its adoption when testing clinical interventions aimed at modifying day-to-day activities or routines intended to influence well-being. Additional study should also test emerging instruments that assess subjective qualities of experience associated with day-to-day action such as the Occupational Value Assessment with predefined items (OVal-pd; Eakman & Eklund, 2011; Eklund, Erlandsson, Persson, & Hagell, 2009). Importantly, the OVal-pd has demonstrated the capacity to assess broad categories of subjective experience such as competence and goal achievement, pleasure and enjoyment, and social connectedness associated with day-to-day activities which may help researchers explore discrete subjective dimensions of occupation (e.g., Hammell, 2009).

Future studies should adopt samples from populations which have been traditionally associated with occupational therapy practice such as those with physical and emotional disabilities to further explore the relationships between meaningful activity and well-being. For

example, despite consistent cross-sectional evidence of the importance of depression in conceptualizing well-being, depression change served little role in explaining the relationship between changes in meaningful activities and meaning in life in the present sample. Future study should therefore target populations more likely to be substantially influenced by depression and negative affect such as persons with persistent mental illness or veteran soldiers with disabilities experiencing depression and post-traumatic stress disorder.

The methods of the present study may limit the generalizability of its findings. The sample was primarily Caucasian and drawn from a university setting so the results may not apply to underrepresented groups. Also, this study adopted multiple regression analysis which may underestimate the extent of statistical mediation reported. Though structural equation modeling with latent variables is preferred as a tool to better account for measurement error, the present sample size was not sufficient for its use (Hayes, 2013). Furthermore, data on three or more time points can facilitate modeling dynamic relationships among variables, and more sophisticated methods than those employed in the present study, such as latent growth modeling and multi-level modeling, would benefit this area of research (Singer & Willett, 2003).

This study sought to argue for causal associations amongst meaningful activity, basic psychological needs and meaning in life as reflected within the MALM model. The use of longitudinal data clearly improved assertions of causality compared with a cross-sectional design, nonetheless, the present method was not adequate to confirm causal relationships. When feasible, true experimental designs would be preferred for rigorously testing causal relationships. Lastly, this study adopted a web-based format in administering the research instruments and therefore the findings may have demonstrated some degree of common method bias.

Conclusion

The present study employed a prospective longitudinal multi-cohort design to determine if change in meaningful activity over an 11 month period could explain change in meaning in life. Findings demonstrated that change in meaningful activity predicted change in basic psychological needs fulfillment (i.e., autonomy, competence, and relatedness) and change in meaning in life. Further, change in meaningful activity was associated with change in meaning in life via two pathways: a direct path from meaningful activities to meaning in life and an indirect path through change in basic psychological needs fulfillment. This study contributes to a growing literature implicating subjective evaluations of day-to-day action (or meaningful activity) as a fruitful means for exploring relationships between occupation and well-being.

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Table 1
Means, standard deviations, and internal consistency for study variables at time 1 (t1) and zero-order correlations with time 2 (t2)

Variable	Mean (<i>SD</i>) t1	α t1	1	2	3	4	5	6	7	8	9	10	11	12
1) DASS-D t1	3.7 (4.0)	.90	-											
2) DASS-D t2	-0.2 (4.5) ‡	-	.40	-										
3) EMAS t1	33.0 (6.5)	.90	-.48	-.34	-									
4) EMAS t2	0.6 (5.93) ‡	-	-.27	-.31	.57	-								
5) BPNS-A t1	5.0 (1.0)	.74	-.55	-.34	.51	.30	-							
6) BPNS-A t2	0.1 (0.9) ‡	-	-.39	-.49	.39	.49	.62	-						
7) BPNS-C t1	5.2 (1.0)	.71	-.55	-.32	.58	.30	.66	.42	-					
8) BPNS-C t2	0.1 (0.9) ‡	-	-.34	-.53	.46	.54	.62	.71	.54	-				
9) BPNS-R t1	5.6 (0.9)	.82	-.51	-.22	.50	.25	.69	.43	.63	.39	-			
10) BPNS-R t2	0.0 (0.9) ‡	-	-.37	-.34	.43	.46	.53	.68	.40	.59	.58	-		
11) MILQ t1	27.5 (6.2)	.90	-.42	-.32	.40	.21	.36	.29	.39	.31	.34	.26	-	
12) MILQ t2	0.0 (5.6) ‡	-	-.28	-.46	.35	.47	.35	.49	.29	.49	.27	.44	.56	-

Note. DASS-D = Depression subscale of the Depression, Stress, Anxiety Scale - 21, EMAS = Engagement in Meaningful Activities Survey, BPNS: A = Autonomy, C = Competence, R = Relatedness subscales of the Basic Psychological Needs Scale, MILQ = Meaning in Life Questionnaire, t1 = time 1 ($N = 345$), t2 = time 2 ($N = 174$), ‡ = t2 - t1 mean change (SD), *SD* = standard deviation, α = Cronbach's alpha, all $p < .01$.

Table 2
Regression Models Predicting Meaning in Life at Time 1 and Time 2

Time 1		Time 2	
Variable	<i>B</i>	Variable	<i>B</i>
DASS-D	-.22 [‡]	DASS-D	-.25**
EMAS	.25 [‡]	EMAS	.29 [‡]
BPNS-A	.12*	BPNS-A	.22**
$R^2 = .26, F [7,337] = 18.6, p < .001$		$R^2 = .36, F [7,166] = 14.6, p < .001$	
DASS-D	-.22 [‡]	DASS-D	-.26**
EMAS	.23 [‡]	EMAS	.29 [‡]
BPNS-C	.12*	BPNS-C	.19*
$R^2 = .26, F [7,337] = 18.6, p < .001$		$R^2 = .34, F [7,166] = 13.9, p < .001$	
DASS-D	-.23 [‡]	DASS-D	-.28 [‡]
EMAS	.26 [‡]	EMAS	.29 [‡]
BPNS-R	.09	BPNS-R	.21**
$R^2 = .26, F [7,337] = 18.3, p < .001$		$R^2 = .36, F [7,166] = 14.7, p < .001$	

Note. DASS-D = Depression subscale of the Depression, Stress, Anxiety Scale - 21, EMAS = Engagement in Meaningful Activities Survey, BPNS: A = Autonomy, C = Competence, R = Relatedness subscales of the Basic Psychological Needs Scale, Time 1 ($N = 345$), Time 2 ($N = 174$), R^2 = adjusted R-Square, additional model variables included: age, gender, cohort, and marital status, ‡ = $p < .001$, ** = $p < .01$, * = $p < .05$.

Table 3
Zero-order correlations between change variables (t2-t1)

Variable	1	2	3	4	5	6
1) DASS-D t2-t1	-					
2) EMAS t2-t1	-.28	-				
3) BPNS-A t2-t1	-.43	.44	-			
4) BPNS-C t2-t1	-.50	.44	.61	-		
5) BPNS-R t2-t1	-.32	.32	.57	.58	-	
6) MILQ t2-t1	-.23	.29	.33	.33	.37	-

Note. DASS-D = Depression subscale of the Depression, Stress, Anxiety Scale - 21, EMAS = Engagement in Meaningful Activities Survey, BPNS: A = Autonomy, C = Competence, R = Relatedness subscales of the Basic Psychological Needs Scale, MILQ = Meaning in Life Questionnaire, t2-t1 = change score (time 2 – time 1), all $p < .01$, $N = 174$.

Table 4
Regression Models Predicting Change in Meaning in Life (t2-t1)

	Unstandardized Beta (<i>SE</i>)	Standardized Beta	<i>t</i>	<i>p</i>
BPNS-A Model				
DASS-D t2-t1	-.10 (.10)	-.08	-1.02	.31
EMAS t2-t1	.15 (.08)	.16	2.03	.04
BPNS-A t2-t1	1.29 (.53)	.21	2.43	.02
Adjusted <i>R</i> -Square* = .14 <i>F</i> < .001				
BPNS-C Model				
DASS-D t2-t1	-.08 (.10)	-.07	-.80	.42
EMAS t2-t1	.16 (.08)	.17	2.09	.04
BPNS-C t2-t1	1.21 (.52)	.20	2.32	.02
Adjusted <i>R</i> -Square* = .13 <i>F</i> < .001				
BPNS-R Model				
DASS-D t2-t1	-.10 (.09)	-.08	-1.10	.27
EMAS t2-t1	.16 (.07)	.17	2.24	.03
BPNS-R t2-t1	1.69 (.49)	.26	3.43	.001
Adjusted <i>R</i> -Square* = .17 <i>F</i> < .001				

Note. BPNS: A = Autonomy, C = Competence, R = Relatedness subscales of the Basic Psychological Needs Scale, DASS-D = Depression subscale of the Depression, Stress, Anxiety Scale - 21, EMAS = Engagement in Meaningful Activities Survey, MILQ = Meaning in Life Questionnaire, t1-t2 = change in variable from Time 1 to Time 2, SE = standard error, * additional model variables not significant included: age, gender, marital status and cohort.

Table 5
Mediation of the Effect of Meaningful Activity Change upon
Meaning in Life Change through Basic Psychological Needs Fulfillment Change

Basic Psychological Needs Variables	Unstandardized Beta (<i>SE</i>)	<i>t</i>	<i>p</i>
BPNS-Autonomy			
a path - Direct effect EMAS t2-t1 to BPNS-A t2-t1	.06 (.01)	6.18	<.001
b path - Direct effect BPNS-A t2-t1 to MILQ t2-t1	1.48 (.50)	2.96	<.01
c path - Total effect EMAS t2-t1 to MILQ t2-t1	.26 (.07)	3.72	<.001
c' path - Direct effect EMAS t2-t1 to MILQ t2-t1	.16 (.07)	2.16	<.05
ab path - Indirect effect from EMAS t2-t1 to MILQ t2-t1*	.10 (.04)	95% CI = .03 - .20	
Ratio of indirect to total effect (ab / c) = .39			
<hr/>			
BPNS-Competence			
a path - Direct effect EMAS t2-t1 to BPNS-C t2-t1	.07 (.01)	6.20	<.001
b path - Direct effect BPNS-C t2-t1 to MILQ t2-t1	1.39 (.47)	2.95	<.01
c path - Total effect EMAS t2-t1 to MILQ t2-t1	.26 (.07)	3.72	<.001
c' path - Direct effect EMAS t2-t1 to MILQ t2-t1	.16 (.07)	2.16	<.05
ab path - Indirect path from EMAS t2-t1 to MILQ t2-t1*	.10 (.05)	95% CI = .02 - .24	
Ratio of indirect to total effect (ab / c) = .39			
<hr/>			
BPNS-Relatedness			
a path - Direct effect EMAS t2-t1 to BPNS-R t2-t1	.05 (.01)	4.22	<.001
b path - Direct effect BPNS-R t2-t1 to MILQ t2-t1	1.83 (.48)	3.82	<.001
c path - Total effect EMAS t2-t1 to MILQ t2-t1	.26 (.07)	3.72	<.001
c' path - Direct effect EMAS t2-t1 to MILQ t2-t1	.17 (.07)	2.50	<.05
ab path - Indirect path from EMAS t2-t1 to MILQ t2-t1*	.08 (.05)	95% CI = .02 - .23	
Ratio of indirect to total effect (ab / c) = .31			

Note. EMAS = Engagement in Meaningful Activities Survey, BPNS: A = Autonomy, C = Competence, R = Relatedness subscales of the Basic Psychological Needs Scale, MILQ = Meaning in Life Questionnaire, t2-t1 = represents change in variable from time 1 to time 2, SE = standard error, * = ab and SE estimates derived through bootstrap sampling and provide 95% confidence intervals; additional model variables were not significant including: age, gender, cohort, and depression.

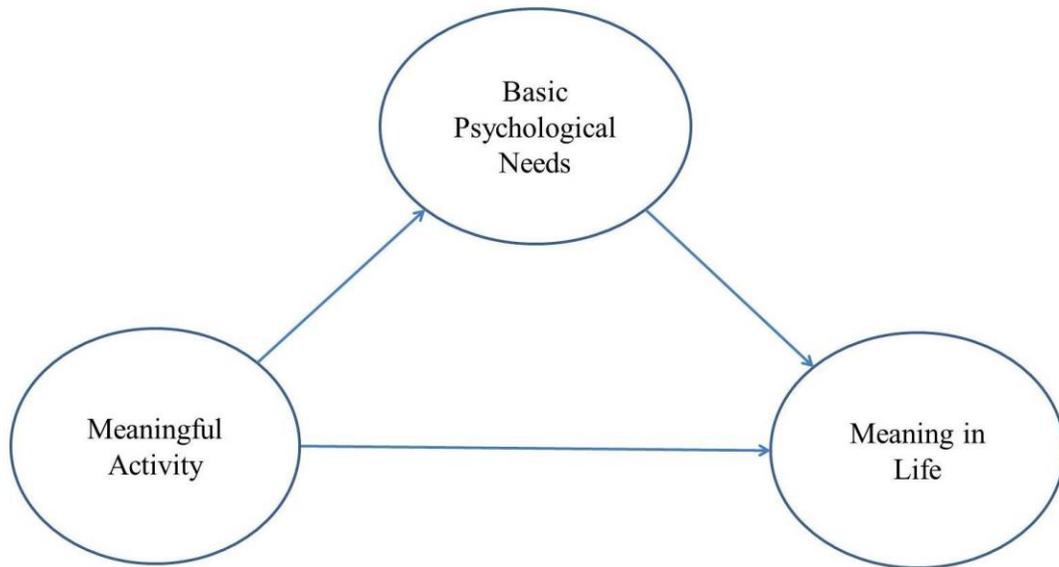


Figure. Meaningful Activity and Life Meaning model