

## Research Reports

# The Relationship Between Physical Health and Meaning in Life Among Parents of Special Needs Children

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## Abstract

Whereas former research has studied the psychological health of parents raising a special needs child (a child with a disability or chronic disease), the present study focused on their perceived physical health in relation to meaning in life. Specifically, it was investigated whether physical health is positively related to the meaning in life dimensions self-actualization, self-acceptance and self-transcendence. Visitors of Dutch internet forums ( $N = 115$ ) completed the Existential Fulfillment Scale and an inventory of subjective health, the VOEG-21. Parents of special needs children were found to suffer more health problems than the average population. In addition, self-actualization and self-acceptance were positively related to their perceived physical health. For self-transcendence, however, a negative relationship was established. The perceived poor health of these parents raising a special needs child implies a need for interventions for this group. The Existential Fulfillment Scale appears to be a useful instrument for identifying those parents in need of such interventions. Self-actualization and self-acceptance seem to be relevant subjects for therapeutic interventions and further research.

*Keywords:* meaning in life, self-acceptance, self-actualization, self-transcendence, physical health, caregiving parents

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The physical health of parents of a special needs child (a child with a disability or chronic disease, who requires health and related services of a type or amount beyond that required by children generally (McPherson et al., 1998) has been relatively neglected in social research, yet this is an important issue. Not only because of the health problems in themselves, but also because of the effect less optimal health has on the daily functioning of the parents (Arafa, Zaher, El-Dowaty, & Moneeb, 2008) and the adverse effect on their children (Barlow & Ellard, 2006; Bromley & Blacher, 1991). The 'meaning in life' concept was introduced by Frankl (1962), to explain why some people cope better than others under enduring circumstances. He believed that finding and fulfilling 'meaning in life' helps one to cope with suffering. A life full of meaning and purpose leads according to Frankl to existential fulfillment; the opposite he called 'existential vacuum' (Frankl, 1962; Frankl, 2004). The 'meaning in life' concept has not been thoroughly investigated among parents of special needs children. A literature search into the subject of beliefs and disabilities resulted in one publication which deals with the subject of spiritual beliefs and disabilities (Treloar, 2002). The author states that there is a lack of literature that explores how people respond to living with a disability using their beliefs. Exploring 'meaning in life' in relation to the physical health of parents

of special needs children extends the limited literature on the subject of beliefs and disabilities and may help in understanding why some parents do better than others when faced with the challenge of bringing up special needs children. It may help to identify those caregivers most at risk and to provide suitable interventions.

A survey conducted in 2000 in the US reported prevalence figures of special needs children in the US of 12.8% (Allen, 2004). Mokkink et al. (2006) calculated the percentage of Dutch children with a chronic disease to be at least 14%. Caring for these special needs children creates extra demands on the parents. Barlow and Ellard (2006) have listed issues such as coming to terms with the diagnosis and prognosis, coping with physical symptoms, disruptions to the daily routine, isolation and difficulty in balancing the needs of healthy siblings. Other authors (Kenny & McGilloway, 2007; Murphy, Christian, Caplin, & Young, 2007) report the unpredictability and uncontrollability of day-to-day-events, lack of time, problems with the caregiver's health, limited energy, emotional stress and anxiety, uncertainty about the future, financial issues, handling problem behavior and frustration at the general lack of understanding.

### **Health Effects on Parents Raising a Special Needs Child**

Demonstrated psychological health effects on parents of special needs children include depression (Olsson & Hwang, 2001) and both clinical and subclinical post-traumatic stress disorder (Guðmundsdóttir, Guðmundsdóttir, & Elklit, 2006). Physical health problems reported are general poor health, chronic fatigue and sleep deprivation, lower vitality and role limitation due to physical health problems (Arafa et al., 2008; Hatzmann, Heymans, Ferrer-i-Carbonell, van Praag, & Grootenhuis, 2008; Murphy et al., 2007; Oelofsen & Richardson, 2006). Health problems can potentially affect almost every aspect of daily life adversely. Functioning and coping can be affected (Hatzmann et al., 2008) and problems may occur at work and in daily activities (Arafa et al., 2008). These affected areas may further increase the existing health problems. Degraded functioning of the parents is likely to have an influence on their children and especially on special needs children as they depend even more on their parents for upbringing and support than healthy children. Parents have indicated that perceived daily stress was an important factor in the decision to place the child out of the home (Bromley & Blacher, 1991) and mental health problems in mothers have predicted behavioral problems in their children (Barlow & Ellard, 2006).

### **'Meaning in Life', Mental and Physical Health**

Frankl (1962) in his psychology of meaning speaks of 'existential vacuum' to denote a way of living without meaning and purpose, which according to him could lead to neuroticism. Finding 'meaning in life' may explain why some people do better than others in difficult circumstances and are able to endure suffering. It is likely that 'meaning in life' may in difficult circumstances provide the motivation to carry on and to deal effectively with the situation, and some protection against physical health problems in a similar way as related concepts such as 'sense of coherence' and hardiness do. Sense of coherence refers to "a generalized orientation towards the world which perceives it, on a continuum, as comprehensible, manageable and meaningful (Antonovsky, 1996, p. 15). It can be considered as a major factor in facilitating the movement towards both physical and mental health by facilitating coping with stressors. Following Kobasa (1979), Clark (2002) describes hardiness as commitment to life, viewing change as challenge, and having control over one's life. Hardiness reduces negative outcomes in stressful situations. The construct is characterized by a proactive approach in handling stressful situations, perception of some control over outcomes, and a collective view of change as advantageous in stressful situations (McCubbin, McCubbin, & Thompson, 1991). Hardiness has been shown to form a protection against physical and mental illness by helping to transform events into less stressful forms (Ouellette Kobasa, Maddi, Puccetti, & Zola, 1985).

Several empirical studies have found support for a relationship between 'meaning in life' and mental health. The construct was found to differentiate between clinical and non-clinical groups, with clinical individuals experiencing less 'meaning in life' than the control group (Debats, 1999). Longitudinal studies have demonstrated higher pre-treatment levels of meaning to be related to less overall psychological distress, more happiness and higher self-esteem post-treatment (Debats, 1996). Higher 'meaning in life' was also related to less depressive symptoms two months later (Mascaro & Rosen, 2005). 'Meaning in life' was found to have a direct negative relationship with depression as well as to exert a buffering effect on the positive relationship between stress and depression (Mascaro & Rosen, 2006). There was a strong relationship between depression and stress for people with a low level of 'meaning in life', but no such relation for individuals with high levels of meaning. All these empirical results are consistent with the view that 'meaning in life' has a positive relationship with mental health, although they do not clearly lead to a conclusion whether 'meaning in life' influences health by acting as a (stress) moderator in distressing circumstances and/or whether 'meaning in life' has a more direct influence on health. It is possible that the 'meaning in life' concept has a similar relevance for physical health.

A strong sense of 'meaning in life' may provide motivation in times of stress as well as energy to effectively deal with stressful circumstances. Positive concepts such as a strong sense of 'meaning in life' may influence physical health through two routes, a biological and a behavioral one. Various positive concepts have been studied in relation to biological functions. Self-affirmation can buffer the neuro-endocrine and sympathetic nervous system responses to stress (Sherman, Bunyan, Creswell, & Jaremka, 2009). Positive illusions may be related to lower hypothamic pituitary-adrenocortical axis levels in rest and lower autonomic responses to stress (Taylor, Lerner, Sherman, Sage, & McDowell, 2003). Positive affect may increase immune functions (Futterman, Kemeny, Shapiro, & Fahey, 1994). It is conceivable that 'meaning in life', by providing one with the positive motivation to deal with stress effectively, influences the biological system in a similar way.

Positive concepts may also influence physical health through behavioral processes (Aspinwall & Tedeschi, 2010). Optimism has been linked to health-promoting behavior (Giltay, Geleijnse, Zitman, Buijsse, & Kromhout, 2007). Finding religious or spiritual meaning has been linked to greater preventive health behavior adherence (Leaf, Aspinwall, & Leachman, 2010). 'Meaning in life' may likewise influence health behavior, and consequently physical health.

### **Operationalization of 'Meaning in Life'**

'Meaning in Life' or existential fulfillment refers to a way of life that is full of meaning and purpose and reveals an existential psychological approach to life (Längle, 2003). The first notion related to existential fulfillment is self-acceptance. Self-actualization is the second notion. The third concept connected with existential fulfillment is self-transcendence (Loonstra, Brouwers, & Tomic, 2007). Self-acceptance refers to having a realistic awareness of one's strengths and weaknesses, understanding one's potential and one's limitations. It is the opposite of rejection of the self and reliance on others. Self-actualization is held by Maslow to be the pinnacle in the hierarchy of human needs. He defines the concept as the desire for self-fulfillment, or, the tendency to become more and more who one is (Maslow, 1943). Self-transcendence, the third notion, is the recognition that one is part of a larger whole, the feeling that there is a meaning in life, and the rising above one's own interests. Studies using the Existential Fulfillment Scale developed by Loonstra, Brouwers, and Tomic (2007, 2009) have supported the use of the three separate dimensions of 'meaning in life'. Among secondary school teachers (Loonstra et al., 2009), all three 'meaning in life' dimensions were positively related to the burnout component self-efficacy, whereas both self-

acceptance and self-actualization were negatively related to the other two burnout components, exhaustion and cynicism.

It is expected that these dimensions of 'meaning in life' will have a similar effect on the physical health of parents of special needs children, who experience a larger amount of stress than the average parent, with an expected positive relationship between the 'meaning in life' components and the subjective physical parental health. In particular, it is hypothesized that people who have a realistic view of their own potential, who rely less on others for acceptance and approval, and suffer less frustration when they fail to reach this (high on self-acceptance) develop a better physical health. This is also hypothesized for people who achieve personal growth and who demonstrate more self-efficacy (high on self-actualization), as well as for those who are able to rise above their own interests (high on self-transcendence). It is expected that people who are high on self-acceptance, self-actualization and self-transcendence suffer less frustration and spend energy more efficiently, and as a result have less physical health complaints.

To summarize, the purpose of this study is to gain insight into the physical health of parents of special needs children and to explore the relationship between 'meaning in life' and their physical health. The hypotheses will be tested after controlling for demographic variables such as age, education, number of children and number of special needs children. They will be investigated among parents of special needs children that visit Dutch internet forums. Most Dutch people have access to a computer; in 2011 96% had access to one and 93% had actually used one during the last three months ([Centraal Bureau voor de Statistiek, 2012](#)). The use of internet forums is nowadays widespread but particularly important for parents of children with an illness or handicap ([Plantin & Daneback, 2009](#)). Caregivers of special needs children were found to visit these type of forums for a combination of information and emotional support ([Baum, 2004](#)). Accessing parents on the internet appears to be a cost and time effective method which allows for flexibility and makes it possible to access hard to reach respondents. Additionally, the respondents are motivated and unlikely to suffer from survey fatigue. Drawbacks, however, are a sample and selection bias ([Sackmary, 1998](#)), so no firm statements can therefore be made about response rate and generalization. Nonetheless, if this study is regarded as an exploratory study into the relation between 'meaning in life' and physical health, the ensuing results can be viewed as preparations for further research into this topic. The theoretical importance will be to expand on the limited previous quantitative research on the 'meaning in life' of parents of special needs children and to broaden the scope of this concept to include the physical health of these parents as well. Furthermore, this research may help in understanding why some parents do better than others when faced with bringing up special needs children. The practical importance lies in the potential use of 'meaning in life' to help recognize which parents are most in need of help and to identify possibilities for intervention using the 'meaning in life' concept. It may help to identify and strengthen parental attributes, leading to a better health and the avoidance of long-term treatment or assistance.

## Method

### Participants

The participants were parents who visited Dutch internet forums aimed at parents of special needs children. A total number of 188 people accessed the survey, 110 people answered all the survey questions and an additional five answered all except for the demographic questions, making a total of 115 participants. For the record, the following survey is based on 115 participants. Most were women (93%) and about half the participants were in the 35-44 age range (55%). Only 1% was younger than 25, 22% was in the 25-34 range, 18% in the 45-54 range

and 4% in the 55-64 range. The majority was living with a partner (88%). The total number of children per family ranged from 1 to 8 with half the families having two children (51%). Most parents had one special needs child (68%), some had two (26%) and the remainder had three (6%). A large proportion (45%) had an university education, which is a much larger proportion than the average 32% in the general Dutch population (Verweij, Sanderse, & van der Lucht, 2011). Of the remainder, 14% had a lower educational level and 41% an intermediate level (the general Dutch averages are 27% and 41% respectively).

### Instruments

The survey consisted of subjective physical health and existential meaning scales. For the background questions, respondents were asked to fill in their age, gender, marital status, number of children and number of special needs children, paid work and education level.

**Subjective Physical Health:** Subjective physical health was measured with the VOEG-21, a short version of the Vragenlijst Onderzoek Ervaren Gezondheid (Inventory of Subjective Health; Joosten & Drop, 1987). The VOEG was originally designed as a stress diagnostic procedure in industrial settings but has since been used in numerous surveys to measure subjective physical health. It is well-known for being an adequate and valid measure of individual subjective health status (Visser, 1983). The VOEG has proven to be a reliable questionnaire to distinguish healthy persons from those in poorer health (van der Horst, Muris, & Nijhuis, 1993). Joosten and Drop (1987) and Janssen, Bakker, and de Jong (2001), among others, reported satisfactory internal consistency coefficients of .85, .88 and .93 in three different studies. The short 21-item version of the VOEG measures complaints in four main areas: the digestive system, breathing apparatus, muscular-skeletal function and fatigue. An example question is “Did you suffer an upset stomach over the last month?” The respondent is supposed to indicate whether he or she suffered from a particular complaint over the last month with a dichotomous yes/no answer to give a total number of complaints.

**Meaning in Life:** Meaning in life was measured with the Existential Fulfillment Scale (EFS; Loonstra et al., 2007). The EFS was developed out of Längle’s Existence Scale (Längle, Orgler, & Kundi, 2003). The 15 item EFS consists of three separate scales, containing five items each. An example of a self-acceptance item is “I find it very hard to accept myself”, of a self-actualization item “Deep inside I feel free” and of self-transcendence “I feel I am part of a meaningful entity”. The answers are measured on a 5-point Likert scale, ranging from 0 (*not at all*) to 4 (*fully*). The summed score for each dimension was used in the current study, a high score reflects a higher sense of meaning. The factorial validity of the EFS was tested among 812 Dutch students, the results showed an adequate fit of the three-factor oblique model. The alpha’s reported were .74 for self-acceptance, .71 for self-actualization and .88 for self-transcendence (Loonstra et al., 2007). The scales have acceptable reliability for this kind of research (Nunnally & Bernstein, 1994).

### Procedure

An invitation to answer an on-line questionnaire in Dutch was published between September 2010 and April 2011 in Dutch internet forums aimed specifically at Dutch parents of special needs children with a wide range of conditions, varying from well-known conditions such as autism to rare syndromes such as Prader Willi or Fragile X Syndrome. The forums were selected to cover all special needs, i.e. physical handicaps, somatic diseases, development disorders, intellectual disability. The length of time the invitation was published on the forums allowed for also the less frequent visitors to these forums to participate. The invitation included a direct link to the survey. Participants remained anonymous.

## Results

The mean values, standard deviations and Cronbach's alphas are reported in Table 1. The reliabilities of the 'meaning in life' subscales self-actualization, self-acceptance and self-transcendence are moderate to high and comparable to those found by Loonstra et al. (2007). The reliability of subjective physical health is high (.85) and equal to one of the consistencies found by Joosten and Drop (1987). The average number of health complaints is remarkably high compared to the Dutch population; the Dutch Central Statistics Office lists 3.3 average complaints for men and 4.5 for women in 2000 (Centraal Bureau voor de Statistiek, 2010) whereas the respondents in the current study report 6.1 ( $SD = 4.0$ ) and 7.9 ( $SD = 4.8$ ) respectively. As the VOG does not appear to have been used to measure health complaints of special needs parents in other studies, it is not possible to make comparisons with other such parents. People with paid work reported less health problems ( $M = 6.96$ ,  $SD = 4.44$ ) than those without ( $M = 9.23$ ,  $SD = 4.94$ ).

Table 1

Means, Standard Deviations, Internal Consistency Coefficients and Correlations between the Variables ( $N = 115$ )

Variable	<i>M</i>	<i>SD</i>	$\alpha$	1	2	3	4	5	6
1 Sex female <sup>a</sup>									
2 Age	40.41	7.78		-.21*					
3 Paid work <sup>b</sup>				.14	-.11				
4 Self-acceptance	2.50	.82	.76	-.18	.30**	-.17			
5 Self-actualization	2.76	.73	.70	-.02	-.09	-.15	.23*		
6 Self-transcendence	2.81	1.09	.88	.22*	-.07	-.09	-.06	.53**	
7 Physical health	7.70	4.73	.85	-.10	.24*	-.23*	.47**	-.23*	-.11

Note. Variables 4–6 are the dimensions of 'meaning in life'.

<sup>a</sup> $n=102$  (93%). <sup>b</sup> $n=70$  (64%).

\* $p < .05$ . \*\* $p < .01$ .

The correlations between the variables are also shown in Table 1. Of the demographic variables, only paid work was found to relate to the dependent variable health.

A hierarchical regression analysis was performed in order to determine the relationship between the 'meaning in life' variables self-actualization, self-acceptance and self-transcendence and subjective health. The relevant demographic value paid work was statistically controlled by including it in the first step (coded 1 for people with paid work and coded -1 for people without paid work). The results are displayed in Table 2.

Table 2

Results of Hierarchical Regression Analysis for the Relationship Between the Meaning in Life Variables and Subjective Health ( $N = 115$ )

Independent variable	<i>B</i>	<i>SE B</i>	$\beta$
<b>Model 1 (<math>R^2 = .05</math>, <math>R^2_{adj} = .05</math>)</b>			
Paid work	-2.27	.92	-.23*
<b>Model 2 (<math>R^2 = .29</math>, <math>R^2_{adj} = .26</math>, <math>R^2_{change} = .24^*</math>)</b>			
Paid work	-1.47	.82	-.15
Self-actualization	0.30	.13	.24*
Self-transcendence	-0.19	.09	-.23*
Self-acceptance	0.43	.10	.38*

\* $p < .05$ .

In Model 1, paid work was found to be significantly related to subjective health ( $\beta = -.23, p = .02$ ). In Model 2, the three 'meaning in life' variables self-actualization, self-acceptance and self-transcendence were added, resulting in 24% additional variance explained ( $R^2_{change} = .24; F(3, 105) = 11.70, p < .001$ ). The contribution of paid work in this model was insignificant. Self-actualization was positively related to health ( $\beta = .24, p = .02$ ), indicating that a higher degree of self-actualization was related to a better health as hypothesized. Self-transcendence was negatively related to health ( $\beta = -.23, p = .03$ ), contrary to the hypothesis, indicating that a higher degree of self-transcendence was related to worse experienced health. Self-acceptance was positively related to health ( $\beta = .38, p < .001$ ), indicating that a higher degree of self-acceptance was related to a better health as hypothesized.

## Discussion

The purpose of this study was to investigate the perceived physical health of parents raising special needs children and to determine whether a relationship could be found with 'meaning in life'. The parents in this study reported a large number of health complaints. 'Meaning in life' was found to contribute significantly to explaining the variance of perceived health. As predicted, a higher sense of self-actualization and of self-acceptance were related to a better perceived physical health. Contrary to the hypothesis, a higher sense of self-transcendence was related to more perceived health problems.

The subjective physical health of the parents in this sample turned out to be considerably worse than the health of the general Dutch population. The continuing stress of raising a special needs child may be responsible for these health problems. This highlights the need to pay more attention to these parents, although it must be born in mind that the high number of health complaints may also be accounted for by the fact that especially the more troubled parents seek support and recognition from an internet forum.

The present findings corroborate with previous research into the relationship of 'meaning in life' with psychological health. 'Meaning in life' was found to relate positively with hope and negatively with depressive symptoms (Mascaro & Rosen, 2005, 2006). It was also shown to be related to three major dimensions of well-being, positively to happiness and self-esteem and negatively to psychological distress (Debats, 1996). Various studies (Loonstra et al., 2007, 2009), including the present one, lend support to the self-acceptance and self-actualization dimensions of 'meaning in life' as relevant constructs in relation to health. For self-transcendence, on the other hand, sometimes no significant relationship is found (Loonstra et al., 2009) or the relationship is in the opposite direction as in the present study. Correlation analysis showed that the three dimensions are significantly related to each other, except the relationship between self-acceptance and self-transcendence. The question remains what its theoretical rationale is. Is there any interdependence, for example one dimension being a necessary but not sufficient condition for another? It is recommended to investigate the inter-relationships between the three concepts that make up existential fulfillment in further detail. That kind of research can support the theoretical development of a model, which describes the growth process of attitudes toward a more existential fulfilling live (Loonstra et al., 2007). The fact that higher degrees of self-acceptance and self-actualization were found to be positively related to better health suggests that these dimensions offer some immunity to health problems. The way they do this may be either through a biological or through a behavioral route, as described above. As for the reason why self-transcendence is negatively correlated with physical health, one explanation may be that self-transcendence involves rising above one's interests. People high on self-acceptance and self-actualization have a realistic view of their own strengths and weaknesses and are focused on personal growth. This may provide them with better resources to cope with the stress involved in dealing with their children's needs, whereas those who rise above their own interests may

use less effective ways of coping and may be more susceptible to burnout from getting overtly involved with their caregiving.

### Limitations and Strengths

Several limitations may have influenced the results of the current study. First, our study was limited by its cross-sectional design, i.e., data were all collected at one time period. This feature precludes any definite conclusion about causality. The relationships shown do not reveal the causal direction.

Second, the direction of causation requires further investigation. Further research using a longitudinal design is needed to clarify this issue, i.e., to evaluate the possibility of a causal relationship between perceived physical health and 'meaning in life'. Longitudinal research design would shed light on the effects of perceived physical health on 'meaning in life'. Likewise, by applying a longitudinal design, the possible common method bias can be reduced. This methodological artifact occurs when the instruments employed affect the scores that are being collected (Doty & Glick, 1998).

Third, the measurements in this study were based on self-reports. Consequently, the extent to which these self-reports accurately reflect perceived physical health and 'meaning in life' is not clear. Naturally, the results of the present study for the association between perceived physical health and 'meaning in life' should be interpreted with caution, but there are no indications that these findings solely reflect biased respondent reporting. Combining self-report data with data obtained in a more objective manner is recommended for further research so that powerful statistical techniques can be applied for hypothesis testing. The findings of the present survey could be used to generate hypotheses for further research.

Fourth, the fact that well-educated parents were overrepresented may make it difficult to generalize these findings. Educational level was taken into account, however, and no relation was found with perceived physical health.

In spite of its limitations, our study has several important strengths. First, the current study ventured into a novel domain of perceived physical health and 'meaning in life'. Second, measurement error was contained since the study employed established instruments with known psychometric properties. Reliability analysis shows that the measurements satisfy psychometric standards. In the study validated metrics were used to measure perceived physical health and 'meaning in life', allowing for the comparison of findings with the general population and across studies. Both internal and external validity was guaranteed. Third, an appropriate multivariate data-analytic strategy was applied, i.e., hierarchical regression. Fourth, the theoretical framework that was adopted may help to organize research findings across investigations. Fifth, the observed association between perceived physical health of parents raising special needs children and 'meaning in life' were not only statistically significant, but also interesting and meaningful.

The fact that parents of special needs children seem to experience more physical health problems than the general population implies that they deserve more attention from health care workers. As the results of this study support the use of the EFS, this instrument can help health care providers to identify those parents with a low level of 'meaning in life', who may be especially vulnerable to health problems and who may benefit from interventions. Several therapies, such as cognitive behavioral therapy, acceptance and commitment therapy, humanistic psychotherapy or counseling, or existential-integrative therapy may be useful to enhance self-acceptance, self-actualization and well-being.



The current study contributed to the knowledge in this domain despite the limitations. However, speculations about the practical relevance of the study are premature. This work is only a first step, and future studies are needed in this area. It might be of interest, for example, to explore ways through which 'meaning in life' could possibly influence physical health. A likely subject could be stress management through coping, as it is conceivable that a higher sense of 'meaning in life', especially its dimension self-acceptance, is related to more effective ways of coping behavior. In addition, targeting parents of lower educational background will enable the results to be generalized to a wider population.

The self-actualization and self-acceptance dimensions of 'meaning in life' have proven to be useful concepts for exploring the physical health of parents of special needs children in a way consistent with prior research into 'meaning in life' and related concepts such as 'sense of coherence' and hardiness. The parents of special needs children reported more health complaints than the average population, suggesting the need to pay more attention to this group. It appears that higher values of self-actualization and self-acceptance are related to better perceived physical health. This highlights the potential for various cognitive therapies to improve the well-being of these parents. The EFS can be a useful tool for identifying those caregiving parents most in need of help and for conducting further research.

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### Competing Interests

The authors have declared that no competing interests exist.

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