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Original Research

A healthy lifestyle can support future sexual satisfaction: results from a 9-year longitudinal survey

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Abstract

Background: Previous follow-up studies have demonstrated the association between good health behavior and good sexual functioning for men, but the longitudinal relationship between multiple health behaviors and satisfaction with sex life remains understudied.
Aim: The aim of the study was to explore whether good health behavior associates with improved satisfaction with sex life for men and women in a follow-up of 9 years.
Methods: This cohort study utilized survey data from the population-based Health and Social Support study. It includes responses from 10 671 working-aged Finns. Using linear regression models, we examined a composite sum score representing 4 health behaviors (range, 0–4) in 2003 as a predictor of satisfaction with sex life in 2012. The analyses adjusted for various covariates in 2003, including satisfaction with sex life, living status, age, gender, education, number of diseases, and importance of sex life in 2012.
Outcomes: The outcome in the study was satisfaction with sex life in the year 2012.
Results: Participants who exhibited better health behavior at baseline demonstrated improved satisfaction with sex life when compared with those with poorer health behavior ($\beta = -0.046$, $P = .009$), even when controlling for the aforementioned covariates. The positive effect of reporting all beneficial health behaviors vs none of them was greater than having none vs 3 chronic conditions. Furthermore, this was almost half the effect of how satisfaction with sex life in 2003 predicted its level in 2012. These findings were supported by an analysis of the congruence of health behavior in the observation period from 2003 to 2012 predicting changes in satisfaction with sex life.
Clinical Implications: The results could serve as a motivator for a healthy lifestyle.
Strengths and Limitations: The current study used a longitudinal large sample and a consistent survey procedure, and it explored the personal experience of satisfaction instead of sexual function. However, the study is limited in representing today's diversity of gender, since the options for gender at the time of survey were only male and female.
Conclusion: These findings indicate that engaging in healthy behaviors contributes to the maintenance and enhancement of satisfaction with sex life over time.

Keywords: health behavior; sexual satisfaction; sexual health; sexual function.

Introduction

Sexual satisfaction throughout life can be an important contributor to lifelong well-being. While popular culture and scientific evidence offer short-term perspectives on boosting sexual satisfaction and its correlates, less is known about factors that contribute to sexual satisfaction over time. This knowledge is needed since sexual pleasure and good sexual health could support self-esteem, body image, interpersonal relationships, and general health, including fertility.[1]

Previous research has shown somewhat unclear results on how personal characteristics associate with sexual satisfaction.[2] In the Finnish working-aged population, women have been more satisfied with their sex life than men, but a decrease in satisfaction was observed as people got older.[3] In other studies, sexual satisfaction has been shown to correlate with relationship factors[2] and sexual function.[4] Furthermore, a complex interplay between sexual function and sexual satisfaction was found to be affected by neurologic, endocrinologic, and vascular systems, as well as psychological processes.[5] In the concurrent research on sexuality, a greater focus has been placed on sexual function as compared with satisfaction. Both are, however, highly relevant due to their internal correlation.[4]

Lifestyle-related diseases associate with sexual dysfunction, especially in men, whereas the evidence is more mixed for women.[6-8] However, vascular health contributes to sexual

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function in both sexes through enhanced erection[9] and vaginal engorgement.[10,11] Therefore, the modifiable risk factors for long-term lifestyle diseases are one of the first-line therapeutic strategies to improve sexual function, and they are of primary importance in the prevention of such diseases.[1]

In men, the most common contributor to sexual problems is erectile dysfunction, which increases significantly after the age of 40 years and affects 50% to 100% of men after the age of 70 years.[12] Cross-sectional evidence has shown an association between erectile dysfunction and unfavorable health behavior, such as alcohol consumption, smoking, and a low level of physical activity.[13,14] In prospective follow-up studies, erectile dysfunction has been associated with obesity, smoking, and low physical activity.[15-18] Also, lifestyle interventions have shown significant effects on erectile function,[19-22] though the sample sizes have generally been small and follow-up times only a few years. However, changes in smoking in midlife might take place too late to yield a significant effect.[15]

The evidence is more limited for women, but an association has been shown between good sexual function and exercise,[10] low alcohol consumption,[23] and nonsmoking.[24] Physical exercise can increase autonomic flexibility, cardiovascular health, and mood, which supports good sexual function.[10] In addition, a longitudinal study showed that physical exercise improved sexual function in women using antidepressants in a follow-up of 3 weeks.[25]

In longitudinal studies, good health behavior has shown an association with good sexual function, especially for men. In addition, positive changes in health behavior interventions have shown a positive effect on sexual function in men and women. Thus far, the longitudinal association between health behavior and satisfaction with sex life has, to the best of our knowledge, not been explored.

The aim of the current study was to explore whether multiple concomitant good health behaviors associate with subsequently improved satisfaction with sex life in a follow-up of 9 years and to broaden the previous perspectives on health behavior and sexual health.

Methods

The data originate in the Health and Social Support study, which examines the psychosocial health of the Finnish working-age population. The study population was recruited in 1998 based on a random sample of working-aged Finns (n = 64 797; original response rate, 40%). The current study uses responses from the follow-up surveys of 2003 and 2012, which included the items on 4 major health behaviors and satisfaction with sex life, resulting in a longitudinal sample of 10 671 individuals. Respondents who had missing information on any health behavior metrics, satisfaction with sex life, or any of the chosen covariates were excluded (n = 10 469 in the final model). For the detailed response rates and attrition of participants, see Figure 1.

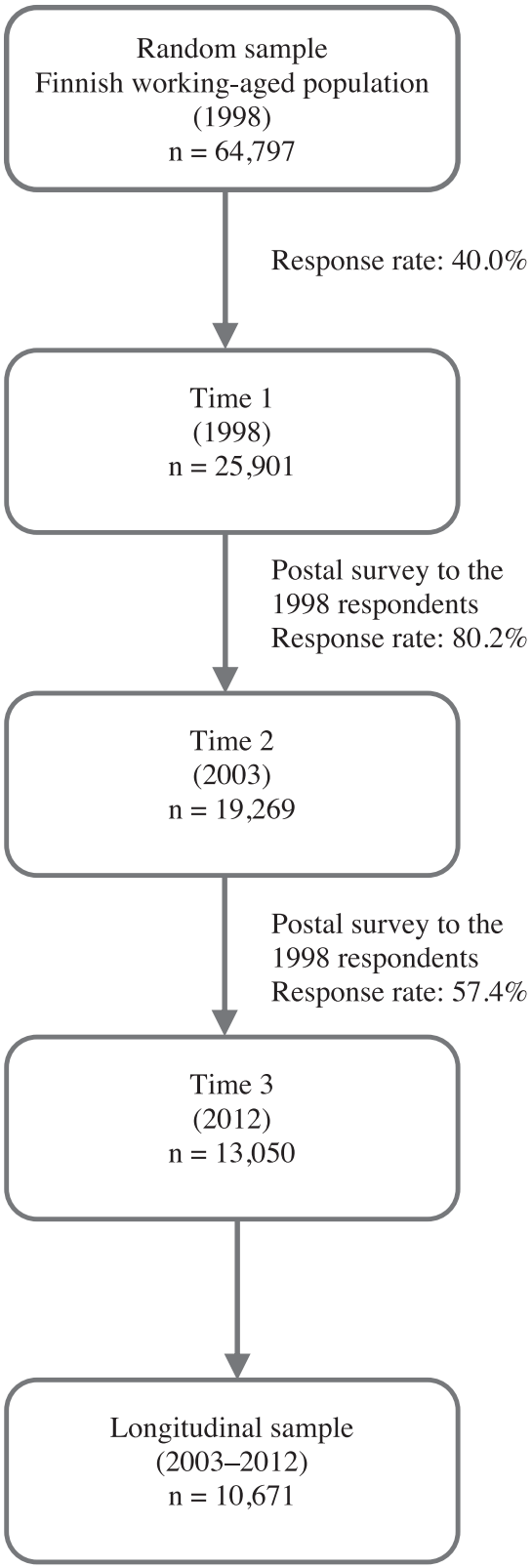

Figure 1. Selection of participants for the present study population of the Health and Social Support (HeSSup) prospective population-based follow-up study.

Good health behavior was measured through self-report by a composite sum score of the 4 major health behaviors[26]: exercise, diet, moderate alcohol consumption, and nonsmoking. The survey items for health behavior can be found in Supplementary File 1. Each beneficial behavior was scored 1 (vs 0 for unhealthy), resulting in a health behavior sum score (HBSS) from 0 to 4. Exercise was converted into metabolic equivalent task (MET) based on responses on the intensity and frequency of physical activity during a week. A MET value ≥2, corresponding to approximately 30 minutes of walking per day, represented beneficial behavior. Dietary

habits were evaluated through 10 food items, each scoring 1 point if adhering to the recommendations.[27] The sum score was multiplied by 10 to provide a percentage of adherence to recommendations. The median on this scale (50 points) was used as the cutoff point. Nonsmoking and moderate alcohol consumption or nondrinker each contributed 1 point to the scale as beneficial behaviors.

The cutoff points for the health behavior domains[28] were based on either previously accepted common cutoffs derived from national guidelines or median values:

Physical activity: inactive MET <2, HBSS = 0 vs active MET ≥2, HBSS = 1.

Dietary habits: sum score median or less (0–50), HBSS = 0 vs sum score more than median (60–100), HBSS = 1.

Alcohol consumption: heavy drinkers (women, ≥140 g/wk; men, ≥280 g/wk), HBSS = 0 vs nondrinkers and moderate drinkers, HBSS = 1.

Smoking: smokers, HBSS = 0 vs former smokers/never smoked regularly, HBSS = 1.

The HBSS was dichotomized to represent its congruence between a high degree of healthy behavior (HBSS = 3 or 4) and a low degree (HBSS = 0-2) in the 9-year follow-up: stable high, increasing (from low to high), decreasing (from high to low), stable low.

Satisfaction with sex life was measured in 2003 and 2012 by a 7-point Likert scale response to "Are you satisfied with your sex life?" as modified from the international Sexual History Form questionnaire.[29] The responses ranged from 1 (very satisfied) to 7 (very unsatisfied). The importance of sex life in 2012 was measured through the question "How important is sex life for you?" on a similar 7-point Likert scale with responses ranging from 1 (very important) to 7 (not at all important). It was used as a covariate in the analyses.

Participants represented 4 age groups in 2003 (25-29, 35-39, 45-49, 55-59 years). Self-reported gender from baseline in 1998 included male and female options. Education was categorized into 4 groups: (1) no professional education; (2) vocational course, school, or apprenticeship contract; (3) college; and (4) university degree, polytechnic, or higher.

General health was measured as a sum score of 21 self-reported chronic conditions and categorized into 0, 1, 2, and ≥3 conditions.[30] Living status in 2003 was categorized as living or not living in a couple relationship.

Statistical analyses

The relationship between health behavior in 2003 and satisfaction with sex life in 2012 was first studied visually, confirming that linear models were appropriate to study the association. Thereafter, linear regression models were used to explore how the HBSS (score, 0-4) in 2003 was associated with satisfaction with sex life in 2012 (score, 1-7). Chronic diseases, the importance of sex life in 2012, and living status in 2003 could affect satisfaction with sex life in 2012 and were therefore included in the models in addition to basic sociodemographic characteristics. To study how the HBSS in 2003 predicts satisfaction with sex life in 2012, the aforementioned statistically significant univariates were added to the model as follows: (1) single-predictor model—no covariates; (2) satisfaction with sex life in 2003; (3) age, gender, and education in 2003; (4) number of chronic diseases in 2003; (5) importance of sex life in 2012; (6) living alone in 2003. The addition of covariates was performed to observe whether a specific covariate makes the effect of HBSS insignificant. As this was not the case, only the results for model 6 are presented. To see whether the effect differed between genders or individuals living in a couple relationship or alone, the interactions with gender and living alone were explored as a final step. However, these interactions were insignificant and not included in the final model.

Ethical considerations

This study was carried out according to the Declaration of Helsinki. With the first survey, participants provided written consent agreeing to a prospective follow-up. The joint Ethical Committee of the University of Turku and the Turku University Central Hospital evaluated the Health and Social Support study and did not consider an ethical statement required at that time, as the study was a postal survey without collection of biological samples. Subsequently, the Finnish national health registry authorities have approved data requests of the cohort based on the participants' signed consent and, by this, also indicated that the study followed concurrent requirements of good scientific practice and adequate protection of the participants' personal integrity.

Results

The demographics of the study participants are presented in Table 1. Of the study population, 63.7% were women. The 4 age groups were represented fairly equally, with the highest proportion in the oldest group (55-59 years, 31.5%). College degree education was most prevalent (39.3%) whereas the lowest proportion had no education (11.8%). Most participants (77.7%) lived in a couple relationship. The biggest proportion of participants showed 3 beneficial health behaviors (42.5%) as compared with none (0.9%), 1 (6.1%), 2 (24.4%), and 4 (26.1%).

Individuals who had better health behavior in 2003 showed modestly improved satisfaction with their sex life in the 9-year follow-up ($\beta = -0.046$, $P = .009$; Table 2). Specifically, satisfaction with sex life was on average 0.2 points higher in the follow-up of 9 years when participants exhibiting all beneficial behaviors were compared with those who had none. Satisfaction with sex life in 2003, with higher numerical values indicating lower experienced satisfaction, was associated with its level in 2012 ($\beta = 0.36$, $P < .001$), which was slightly stronger than the favorable effect of belonging to the oldest vs youngest age group ($\beta = -0.28$, $P < .001$) and being woman vs male ($\beta = -0.35$, $P < .001$) when adjusting for baseline satisfaction with sex life and the other covariates. In the same model, a favorable association was observed between satisfaction with sex life in 2012 and not living in a couple relationship in 2003 ($\beta = -0.11$, $P = .004$) and the importance of sex life in 2012 ($\beta = 0.24$, $P < .001$) vs the nonfavorable effects of having highest education vs no education in 2003 ($\beta = 0.18$, $P = .002$), and reporting initially ≥3 diseases vs no diseases ($\beta = 0.10$, $P = .03$). Therefore, the favorable effect on satisfaction with sex life between poorest and best health behavior in 2003 is stronger than the effect of having none vs 3 chronic diseases.

The estimate for the effect of health behavior changed from 0.070 to 0.045 and significance from $P < .001$ to $P = .009$ when model 4 was adjusted for the importance of sex life in 2012. The congruence of health behavior was also tested as a predictor of satisfaction with sex life adjusted for the aforementioned covariates. Stable high ($\beta = -0.14$, $P = .001$) and increasing to high ($\beta = -0.13$, $P = .02$) were associated

Table 1. Descriptive statistics for average satisfaction with sex life in 2003 and 2012, importance with sex life 2012, and HBSS in 2003 by study characteristics.[a]

Variable	Study population	Satisfaction with sex life, mean (SD)		Mean (SD)		HBSS 2003 score, % (No.)				
		2003	2012	Importance of sex life 2012	Overall HBSS 2003	0	1	2	3	4
Total sample	10 671	3.30 (1.76)	3.52 (1.75)	3.40 (1.74)	2.87 (0.90)	0.9 (91)	6.1 (655)	24.4 (2602)	42.5 (4532)	26.1 (2791)
Gender										
Female	63.7 (6793)	3.25 (1.75)	3.47 (1.75)	3.75 (1.76)	2.99 (0.87)	0.3 (35)	2.9 (312)	13.7 (1463)	27.0 (2879)	19.7 (2104)
Male	36.3 (3878)	3.37 (1.76)	3.60 (1.75)	2.78 (1.53)	2.66 (0.92)	0.5 (56)	3.2 (343)	10.7 (1139)	15.5 (1653)	6.4 (687)
Age 2003, y										
25-29	20.8 (2222)	3.22 (1.76)	3.48 (1.72)	2.91 (1.43)	2.91 (0.84)	0.1 (11)	1.0 (103)	4.81 (513)	9.7 (1037)	5.2 (558)
35-39	20.72237	3.31 (1.79)	3.52 (1.80)	3.09 (1.66)	2.83 (0.89)	0.1 (14)	1.4 (150)	5.3 (570)	9.2 (980)	4.9 (523)
45-49	26.7 (2846)	3.28 (1.76)	3.50 (1.74)	3.42 (1.73)	2.82 (0.94)	0.3 (35)	2.0 (217)	6.6 (707)	10.8 (1154)	6.9 (733)
55-59	31.5 (3366)	3.35 (1.72)	3.56 (1.76)	3.91 (1.86)	2.91 (0.91)	0.3 (31)	1.7 (185)	7.6 (812)	12.8 (1361)	9.2 (977)
Education 2003										
No professional education	11.8 (1258)	3.28 (1.79)	3.44 (1.79)	3.66 (1.90)	2.66 (0.93)	0.2 (19)	1.1 (112)	3.6 (381)	4.8 (507)	2.3 (239)
Vocational school	28.9 (3063)	3.25 (1.78)	3.48 (1.78)	3.42 (1.79)	2.71 (0.92)	0.3 (30)	2.6 (274)	8.0 (849)	12.3 (1303)	5.7 (607)
College	39.3 (4173)	3.27 (1.73)	3.54 (1.75)	3.35 (1.71)	2.91 (0.89)	0.3 (34)	2.0 (215)	9.3 (988)	16.8 (1783)	10.9 (1153)
University	20.0 (2133)	3.42 (1.74)	3.58 (1.70)	3.30 (1.62)	3.13 (0.81)	0.1 (8)	0.5 (51)	3.5 (374)	8.6 (914)	7.4 (786)
Diseases 2003										
0	18.0 (1909)	3.07 (1.64)	3.39 (1.70)	3.15 (1.64)	2.95 (0.85)	0.1 (10)	0.8 (86)	4.1 (431)	8.0 (851)	5.0 (531)
1	23.5 (2494)	3.20 (1.74)	3.42 (1.68)	3.21 (1.63)	2.89 (0.88)	0.1 (15)	1.4 (148)	5.5 (587)	10.2 (1088)	6.2 (656)
2	20.3 (2160)	3.25 (1.74)	3.46 (1.74)	3.34 (1.71)	2.88 (0.91)	0.2 (21)	1.2 (129)	4.9 (521)	8.5 (902)	5.5 (587)
≥3	38.2 (4061)	3.49 (1.81)	3.66 (1.81)	3.66 (1.84)	2.81 (0.93)	0.4 (45)	2.7 (290)	9.9 (1050)	15.7 (1671)	9.5 (1005)
Living status 2003										
Couple relationship	77.7 (8278)	3.08 (1.64)	3.44 (1.72)	3.30 (1.69)	2.90 (0.88)	0.5 (54)	4.3 (463)	18.4 (1966)	33.8 (3607)	20.5 (2188)
No couple relationship	22.3 (2384)	4.05 (1.93)	3.79 (1.86)	3.73 (1.89)	2.78 (0.97)	0.4 (37)	1.8 (192)	5.9 (631)	8.6 (921)	5.7 (603)

Abbreviation: HBSS, health behavior sum score. [a]For satisfaction with sex life and importance of sex life, higher values indicate lower satisfaction and lower importance, whereas higher HBSS indicates better health behavior. Subgroups differ slightly in total number due to missing covariate values (10 624–10 671).

Table 2. Estimates for HBSS in 2003 and covariates predicting satisfaction with sex life in 2012 (n = 10 469).[a]

Variable	Estimate	SE	*P* value
Intercept	1.51	0.090	<.001
HBSS 2003	–0.046	0.017	.009
Satisfaction with sex life 2003	0.36	0.009	<.001
Gender			
Female	1 [Reference]		
Male	0.35	0.034	<.001
Age 2003, y			
25-29	1 [Reference]		
35-39	–0.084	0.047	.074
45-49	–0.18	0.046	<.001
55-59	–0.28	0.047	<.001
Education 1998			
No professional education	1 [Reference]		
Vocational school	0.085	0.052	.10
College	0.19	0.051	<.001
University or higher	0.18	0.057	.002
Diseases 2003			
0	1 [Reference]		
1	–0.012	0.047	.80
2	0.011	0.049	.82
≥3	0.10	0.045	.03
Importance of sex life 2012	0.24	0.009	<.001
Living status 2003			
Couple relationship	1 [Reference]		
No couple relationship	–0.11	0.038	.004

Abbreviation: HBSS, health behavior sum score. [a]Higher numerical value in satisfaction with and importance of sex life indicates lower rating of satisfaction or importance.

with significantly improved satisfaction with health behavior during the follow-up (Table S2.1). Of the 4 health behaviors analyzed individually, only alcohol consumption showed a significant effect on satisfaction with sex life ($\beta = -0.21$, $P = .001$) with the same covariates as displayed in Table 2.

Discussion

This study on 10 700 working-aged Finns showed a positive association between health behavior and satisfaction with sex life in a follow-up of almost a decade, even when controlling for baseline satisfaction with sex life, age, gender, education, diseases, living status, and the importance of sex life after 9-year follow-up. Thus, it provides additional support for healthy behavior as an important contributor to satisfaction with sex life throughout life. This now verified long-term relationship may further act as a positive motivator for individuals to engage in healthy behavior.

As shown in previous studies, good health behavior and lifestyle interventions associate with improved sexual functioning,[15-22,25] which might be one of the major pathways to explain how health behavior associates with satisfaction with sex life. Our results support these findings, as sexual functioning and satisfaction are associated.[4] However, we now filled the gap of knowledge by broadening the perspective beyond sexual functioning to the self-perceived satisfaction with sex life, which better reflects the desire and goal of a mature human being than proper sexual functioning alone. Such broadening of perspective beyond sexual function is especially valuable for women, as longitudinal evidence for their sexual health is more limited.

Supporting favorable health behavior change is considered one of the most complex scientific challenges.[31,32] New perspectives to support health behavior change are needed when facing the rapid increase of lifestyle-related chronic diseases.[33] Health behavior change could be motivated by connecting it to multiple positive outcomes, such as global life satisfaction,[34] sexual function, and satisfaction with sex life. Satisfaction with sex life not only reflects physical sexual fulfillment but also satisfaction in one's mutual intimate relationships. Therefore, satisfaction with sex life represents multiple important areas in a person's life. When we explored the health behaviors individually, only alcohol consumption showed a significant effect on satisfaction with sex life. This could suggest that alcohol consumption might have the strongest weight on prospects in satisfaction with sex life when studying dichotomous health behaviors. However, note that alcohol consumption included the smallest proportion of individuals living unhealthily, since the cutoff point was at risk-use level. Therefore, this result is informative for a low proportion of individuals, whereas the sum score of health behaviors aims to provide an overall evaluation of lifestyle.

The magnitude of the effect of health behavior on subsequent satisfaction with sex life is modest when compared with the effect of the other covariates in the model. Nevertheless, health behavior has many beneficial health and subjective well-being effects, and its role with respect to satisfaction with sex life is probably enhanced by various other mechanisms than solely its own direct effect. In a follow-up of almost a decade, a variety of factors related to better health behavior can beneficially affect sexual satisfaction. Thus, the results indicate a trend that good health behavior supports positive development in satisfaction with sex life on a population level.

The study population shows acceptable representation of the Finnish working-aged population[35]; therefore, the results can be generalized to the Finnish population. Furthermore, the results could be generalized with some caution to Western countries that share a similar culture in forming romantic relationships and sexuality—including, for example, voluntarily chosen partnerships and unpenalized sex outside the marriage.

Strengths and limitations

The consistent study procedure and a large population-based random sample support the validity and generalizability of the results. The internal validity of the results is also supported by the measure of congruence of health behavior in the observation period from 2003 to 2012, showing a similar effect on satisfaction with sex life. Focusing on self-perceived satisfaction with sex life rather than functional measures provides new insights into sexual health with a focus on what is meaningful for the individual. This effectively serves the goal of finding supportive motivators for health behavior change, which should be seen as a complex network of beneficial effects on one's overall health and well-being. To the best of our knowledge, the study is the first to examine the relationship between health behavior and satisfaction with sex life in such an extensive follow-up.

Self-perceived satisfaction with sex life is measured with 1 item. It is a very personal assessment, not allowing causal inferences. Thus, it limits the insights of possible contributors

to satisfaction with sex life, such as sexual function. This also might reduce the internal validity, as multi-item measures might be preferable, depending on the aims of the study. One-item measures have successfully been used to examine, for example, self-rated health,[36] life satisfaction,[37] and quality of life[38] in large-scale surveys to provide insights on trends and levels in the population level. All our measures are based on self-report, which can especially somewhat bias the evaluation of health behavior, resulting in underreporting of unhealthy behavior. Although the estimate for the effect of health behavior is modest and the significance decreases when covariates are added, it still appears promising in describing trends in a population. Even though generalizability to the Finnish working-aged population has been good,[35] the population with severe functional limitation is probably underrepresented. Furthermore, the culture around sexuality is changing; thus, the concomitantly aging data are challenging the external validity. For example, the study is limited in representing today's diversity of gender, since the options for gender at the time of survey were only male and female.

Further study

The current study suggests that the importance of sex life might influence the studied relationship. Therefore, the importance of sex life could be explored as a mediator in the relationship between health behavior and satisfaction with sex life. Similarly, sexual functioning and health status could be tested as mediators in the relationship. A more nuanced measure for sexual satisfaction could deepen the insights on causalities in sexual health and improve the internal validity of the results. Furthermore, health behavior could associate with satisfaction with sex life through other routes. For example, satisfaction with sex life associates with various relationship characteristics,[2] which could be affected by health behavior. Exploring such potential pathways could contribute to a deeper understanding of the dynamics of sexual health. The current study included the 4 major health behaviors, excluding e.g. drug use, which has been shown to have an effect on sexual functioning.[1] Such additional health behaviors could be explored further. In addition, the effect of individual health behaviors, especially alcohol consumption, could be studied in more detail.

Implications

Health behavior change is often experienced as an unappealing burden. These results contribute to the body of evidence highlighting positive effects of health behavior change. The effects on sexual health and satisfaction could be communicated as positive outcomes when lifestyle changes are discussed with patients.

Conclusion

The findings of this study suggest that engaging in healthy behavior contributes to sustained or improved satisfaction with sex life over time, thereby serving as a motivator toward a healthy lifestyle.

Author contributions

Conceptualization: S. Stenlund, H.K.-H., H.L., and S. Suominen. Data curation: L.S. Formal analysis: L.S. Funding acquisition: S. Stenlund. Investigation: P.R. and S. Suominen. Methodology: S. Stenlund, L.S., H.L., and S. Suominen. Project administration: S. Stenlund. Supervision: S. Suominen. Visualization: S. Stenlund. Writing–original draft: S. Stenlund. Writing–review and editing: S. Stenlund, L.S., H.K.-H., P.R., H.L., and S. Suominen. All authors have read and agreed to the published version of the manuscript.

Supplementary material

Supplementary material is available at *The Journal of Sexual Medicine* online.

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Conflicts of interest

None declared.

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