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Does initial behavior predict our physical fitness and health 18 years later?

Lena Lämmle [a,*], Darko Jekauc [b], Alexander Woll [d], Susanne Tittlbach [c], Klaus Bös [d]

[a] Technische Universität München, Georg-Brauchle-Ring 60/62, 80992 München, Germany
[b] University of Konstanz, Sportwissenschaft Fach 30, 78457 Konstanz, Germany
[c] University of Bayreuth, Universitätsstraße 30, 95447 Bayreuth, Germany
[d] Karlsruhe Institute of Technology, Engler-Bunte-Ring 15, Geb. 40.40, 76131 Karlsruhe, Germany

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ABSTRACT

Objectives: The aim of the present paper was, first, to analyze a four level biopsychosocial model to examine the interaction of various initial health behaviors and, second, their consequences with respect to the course of physical fitness (PF) and health of adults over the course of 18 years.
Design: Longitudinal study based on medical examinations and self-ratings.
Method: Path analysis along with latent growth curve analysis was based on the German study about the relationship of physical activity, fitness and health (1992–2010). Data were collected from 495 adults (243 women) with an average age of 45.03 years in 1992 (SD = 7.45). Participants were randomly selected from the official registers of local residents' registration offices in the community of Bad Schönborn.
Results: For the mean PF and health levels in 1992, direct and indirect influences were shown on four levels including socioeconomic status and immigration on the first level, outcome expectations and stress coping strategies on the second level as well as eating patterns and physical activity on the third level; furthermore, the course of PF and the course of health (from 1992 until 2010) were affected by the initial behaviors (physical activity and eating patterns in 1992); finally PF and health were not related.
Conclusions: Influences on four levels provided evidence for the complexity of PF and health (outcome level). Initial behaviors predicted current PF and health status, as well as their course. Thus, preventive measures should ensure that healthy behaviors are adopted early in adulthood.

Past longitudinal research has shown that inadequate physical activity (PA), poor eating patterns and smoking contribute to an increased risk of such chronic diseases as coronary heart disease, stroke, diabetes, and cancer, when analyzing both health behaviors and health outcomes simultaneously over time (Ford et al., 2010; Knoops et al., 2004). However, to our best knowledge, it has not yet been analyzed what the long-term prognosis of initial behaviors (from the present study in 1992) is on the course of health (in the present study from 1992 until 2010) in adults? Furthermore, inadequate physical activity (USDHHS, 2011), poor eating patterns (Lukaski, 2004) and smoking (Conway & Cronan, 1992) are associated with lower physical fitness (PF) levels when analyzing both health behaviors and PF outcomes simultaneously over time. Once again, information is lacking on what the long-term prognosis of initial behaviors (in the present study in 1992) is on the course of PF (in the present study from 1992 until 2010) in adults? Consistent with the awareness of the health and PF benefits during the past years, a decrease in smoking (Centers for Disease Control and Prevention, 2009; Ford et al., 2010; Mackay & Eriksen, 2002; Motel-Klingebiel, Wurm, & Tesch-Römer, 2010), an increase in leisure-time PA (Ford et al., 2010; Haskell et al., 2007; Knuth & Hallal, 2009; Motel-Klingebiel et al., 2010), but relatively stable eating patterns in many developed countries have been observed (Chapman, 2010). With regard to an advancement in age, PA either declined (Ford et al., 2010; Motel-Klingebiel et al., 2010; Westerterp & Meijer, 2001) or remained rather stable (Knoops et al., 2004). The same is largely true for smoking behavior (Ford et al., 2010; Knoops et al., 2004; Motel-Klingebiel et al., 2010). The findings on aging and eating patterns revealed either improved (adequate) eating patterns (De Groot, Verheijden, de Henauw, Schroll, & van Staveren, 2004; Ford et al., 2010; Mensink, Burger, Beitz, Henschel, & Hintzpeter, 2002), or relatively stable eating patterns (Burgoine et al., 2009; Knoops et al., 2004). Despite these particular positive trends, the percentage of persons fulfilling recommendations or

* Corresponding author. Tel.: +49 89 289 24669; fax: +49 89 289 24555.
E-mail address: lena.laemmle@tum.de (L. Lämmle).

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guidelines required to induce health benefits with regard to PA and eating patterns still remains insufficient: The World Health Organization's (WHO) recommendation of PA is only fulfilled by 40% of the world population (WHO, 2011a). For eating patterns, the recommendations and guidelines differ between countries. However, fruit and vegetable consumption is seen to be important in preventing major diseases (WHO, 1998). A little more than one half of the German adults fulfill the WHO recommendation of fruit and vegetable consumption (Mensink et al., 2002). Thus, information on determinants of health behaviors is still fundamental for developing future effective behavioral change intervention programs (Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008). Therefore, our research focus was to analyze and compare several preconditions of initial health-relevant behavioral patterns and the longitudinal predictions of these patterns on the course of PF and health over the course of 18 years. If initial behavior (which is not always consistent with the recommendations) predicts the course of PF and health, behavioral change intervention programs should focus on young adults. If not, prevention and intervention measures should focus on health behavior adoption and especially on maintenance to steadily preserve health benefits. For analyses, we used a biopsychosocial model which is described in the following.

Relevance of biopsychosocial approaches

To increase the ability to predict and potentially prevent health risk behaviors and consequently health, both distal and proximal determinants of those behaviors should be regarded. Distal determinants tend to be more stable relative to proximal determinants and are further expected to influence health behavior mainly via these proximal determinants (Flay & Petraitis, 1994; Jessor, 1998). Consequently, the need to integrate theories in order to prevent complex health risk behaviors has increasingly been recognized (Fishbein et al., 2001). Accordingly, empirical research has not only shown associations within distal and proximal determinants (e.g., Ravens-Sieberer, Erhart, Gosch, & Wille, 2008), but also effects of distal and proximal determinants on health behaviors (e.g., Hanson & Chen, 2007; Morland, Wing, & Diez Roux, 2002). Furthermore, associations within health behaviors and associations between health behaviors and health have been observed (e.g., Sallis & Glanz, 2009). However, such empirical evidence is mostly based on bivariate findings and not on comprehensive approaches as is suggested by theory. Thus, a comprehensive distal-proximal concept is needed to examine if support for the assumed complex interplay of distal and proximal factors on health behavior and health can be provided. Consequently, the first aim of the biopsychosocial approach was to add past research on bivariate findings of distal and proximal factors of health behavior, health behaviors and health in one model. This model offers the opportunity to examine if recent bivariate findings still hold true when considering them comprehensively. More precisely, it will be possible to examine if there are moderation, mediation suppression effects or effects of common variance between distal factors, proximal factors, health behaviors and health. Based on these findings the second aim of the biopsychosocial approach was, to derive a second model which is not oriented to a bivariate, but on a distal-proximal comprehensive concept as suggested by theory. This finding-based model can therefore function as an aid in identifying the level – distal or proximal – on which interventions would be most fruitful. Furthermore, information on the interplay of proximal and distal factors with health behaviors and their consequences on health will also be available.

In the present study, the health behaviors considered are PA, eating patterns and smoking. Past bivariate findings on distal and proximal factors of these behaviors, the interplay of these behaviors, and their consequences on health are presented in the following paragraph and also Supplementary Table 1 (Supplementary Table 1 gives an overview of these past findings). These past bivariate findings are the foundation of the analyzed model which is presented in Fig. 1. This biopsychosocial model therefore simultaneously examines the influence of distal (first level: environmental factors), proximal (second level: personal factors) and behavioral factors (third level) on physical fitness and health (fourth level). It is assumed that environment influences personal factors and that both result in health behaviors. Health behaviors are then assumed to affect body composition. Within each level, interferences are possible but not necessary. The following paragraphs summarize the bivariate findings on which the biopsychosocial model is based.

Empirical support for determinants and consequences of PA, eating patterns, and smoking

Distal, proximal determinants and consequences of PA. PA is an important factor for successful aging (McAuley et al., 2007). Several psychosocial factors have been shown to impact PA across the adult lifespan (Cotter & Lachman, 2010; McAuley et al., 2007). Social support (Trost, Owen, Bauman, Sallis, & Brown, 2002), sense of coherence (Savolainen et al., 2009), stress coping strategies (Wijndaele et al., 2007), and motivation (Biddle, 1995) have been shown to affect PA and were therefore considered in the present analysis. Besides, environmental factors like SES could be shown to have an indirect effect on PA through such psychosocial variables (Ishii, Shibata, & Oka, 2010). Also immigration status has been shown to be associated with PA (Dotevall, Rosengren, Lappas, & Wilhelmsen, 2000). PA is further associated with having beneficial effects on PF (U.S. Department of Health and Human Services (USDHHS), 2011) and health in adults (Thomas, Baker, & Davies, 2003). Finally, there is some evidence that there is a relationship

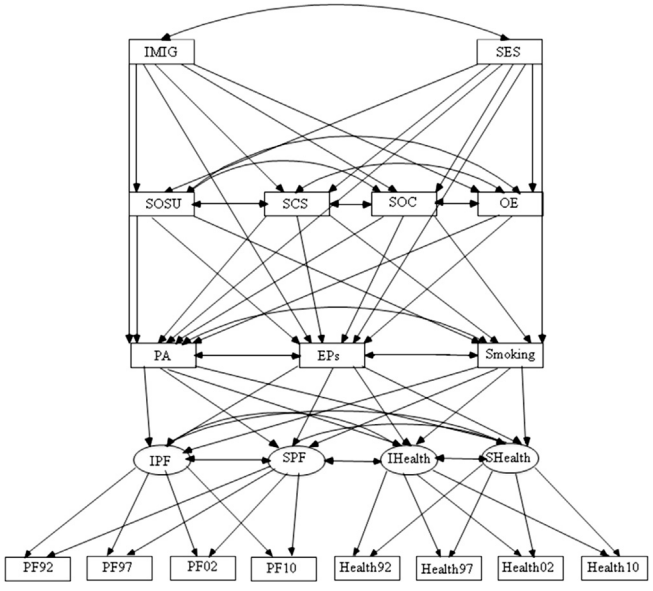

Fig. 1. Biopsychosocial model based on previous bivariate findings. Abbreviations: IMIG = immigration, SES = socio-economic status, SOSU = social support, SCS = stress coping strategies, SOC = sense of coherence, OE = outcome expectations, PA = physical activity, EPs = eating patterns, IPF = intercept physical fitness, SPF = slope physical fitness, IHealth = intercept health, SHealth = slope health, PF92 = physical fitness 1992, PF97 = physical fitness 1997, PF02 = physical fitness 2002, PF10 = physical fitness 2010, Health92 = Health 1992, Health97 = Health 1997, Health02 = Health 2002, Health10 = Health 2010.