

Relationship between Asian martial arts and health-related quality of life in Germany

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Abstract

Aim Due to the steady increase in health care costs, a greater focus on maintaining wellness and preventing health issues has been established. Historically, Asian martial arts were closely associated with maintaining healthfulness. Thus, the aim of this investigation was to determine if people who practice Asian martial arts gain any health-related quality of life benefits compared to the general population.

Subject and methods Therefore, 343 martial artists practicing 8 varieties of martial arts answered the German standardized questionnaire 36 in a controlled setting at 24 martial arts schools (3 schools per martial art) between February 2008 and July 2008. These participants were not given information regarding the purpose of the study. Additionally, between July 2008 and December 2008, 2,512 martial artists completed an online version of the German standardized questionnaire 36.

Results The results of those completing the questionnaire in person differed from those responding to the online questionnaire. Compared to the general public, both martial arts groups rated their health-related quality of life to be better. Of the parameters evaluated, the greater differences were observed for physical aspects of health than for psychological aspects.

Conclusion Thus, these results indicate that participation in martial arts provides health-related quality of life benefits associated with the prevention of health problems. However, further studies are needed to understand the complex relationship between the practice of martial arts and improved health.

Keywords Martial arts · Primary prevention · Health-related quality of life · German standardized questionnaire 36

Introduction

Currently, Asian martial arts are practiced by many thousands of Germans in all age groups. The largest association, with more than 200,000 members, is the Judo Federation, followed by the Karate Association (~110,000 members), the Jujutsu Association (~60,000 members), and the Taekwondo Union (~45,000 members). Each of the martial arts schools are organized by the corresponding associations, but are also supplemented by both commercial and private institutions and organizations. Further, the vast number of different martial arts styles available throughout Germany underlines the popularity of this sport.

In addition to the common martial arts styles like judo, karate, jujutsu, and tae kwon do (TKD), other lesser known styles, such as ESDO, kendo or Wing Tsun, are also practiced. Further, there are enumerable rare styles of martial arts practiced, making it impossible to fully account for all of the different martial arts styles available in Germany. The aim of this study was to determine if those who practice Asian martial arts feel healthier—physically and psychologically—than the rest of the German population.

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There has been a steady increase in health care costs in Germany over the last several years. In 2007, the cost of health care was approximately 252.8 billion euros, which represents a 3.2% (or 7.8 billion euros) increase over the previous year. Per person, these health care costs are 10.4% of the gross domestic product (or 3,070 euros) per household and are slightly higher than previous years (2,970 and 2,900 euros in 2006 and 2005, respectively). Between 2000 and 2006 health care costs increased only 1.4% per person in Germany. This relatively slow rise in health care costs was partially due to the implementation of cost-reducing health care reform (Federal Statistical Office 2007). Given the continued increase in health care costs in Germany, ways to stimulate a broader sense of health consciousness among the general population, as well as developing strategies for the prevention of health problems, have gained attention in political and social arenas (SPD/Greens 2005).

The WHO Ottawa Charter (1986) is regarded as a milestone of modern illness prevention and health promotion. Preventing health-related issues and promoting wellness have become broadly relevant social topics and active areas of research. The Federal Ministry of Education and Research (BMBF 2006) in Germany has recognized the importance of primary prevention, which refers to any prophylaxis that is able to prevent an illness from occurring. This includes education for managing individual health risks and support/treatment aimed at changing high-risk behavior. Rosenbrock (2008) believes that improvements in primary prevention efforts are necessary to adequately face upcoming challenges in health politics. However, the BMBF states that the number of studies that measure the effectiveness and efficiency of primary prevention and health promotion are insufficient. Superior indicators and devices of evaluation used to determine the quality of structures, processes, and results still need to be developed.

Asian martial arts have a tradition and culture dating back several thousand years. In addition to the physical aspects of martial arts, traditional martial arts training programs also include the teaching of social values and methods to establish and maintain health. For example, part of the original martial arts curriculum included respecting creation, treating your fellow men right and peacefully, abstaining from alcohol and tobacco, moderating your eating habits, and the regular practice of meditation techniques (Dolin et al. 1988).

The concepts taught through martial arts are similar to the primary prevention concepts established by the German compulsory health insurance companies. Their head organizations have defined the standard primary spheres of preventive activity, such as motion, nutrition, relaxation, handling strain, prevention of addiction, and the general

competence of life (Head Organization of Health Insurances 2008). Since these ideas are all covered by martial arts education, the practice of Asian martial arts could be one means to improve the health standards of the German population and therefore help to reduce public health care costs.

Currently available studies show only what impacts the practice of martial arts can have on the person's psychological and physical health. A study by Held (2004) that examined 180 people showed that the practice of TKD provided a positive impact on the person's subjectively perceived state of health. Participants reported that they had more energy and felt less stressed than before the workout. A report by Binder (2007) showed that several investigations over the last 30 years about the health benefits of martial arts had concluded that positive psychosocial changes are observed in people practicing martial arts. In contrast, three studies did not detect any changes (positive or negative) in the participants and three other studies showed that martial arts training has a negative impact on healthfulness. It is widely held that including only the physical aspects of martial arts training and omitting the teaching of ethical and moral values is responsible for the observed negative impacts. Although this question remains unanswered, martial arts are viewed as a potential alternative or additional therapy to treat mental health problems. The benefit of martial arts for mental health problems was supported by a case study by Weiser et al. (1995). Further, studies by Terry (2006) and Bitzer-Gavornik and Unterrainer (2006) on karate show that athletes of different ages consider themselves to be mentally tougher.

Other studies have shown that breaking off training has an opposite effect on the psychology of advanced karate athletes. Both men and women reported increased anger, negative emotions, depression, and noticeable strain and mood swings (Szabo 2001). In other studies, martial artists were found to not be more violent (Grabert 2001) and did not display increased aggression (Hoffmann 2006).

The risk of injury associated with martial arts could be seen as a negative factor for the prevention of health issues. The number of injuries experienced by 263 martial artists among five different styles was investigated by Zetaruk et al. (2005). Athletes who practiced TKD had a risk of injury three times higher than those who practiced Shotokan karate or kung fu. The number of injuries was similar between men and women. Burke et al. (2003) investigated the number of injuries during a TKD tournament with 2,498 participants. Previous tournaments had a rate of injury as high as 25/1,000 to 12.7/100; however, this tournament had a 0.4/1,000 rate of injury. These authors concluded that TKD was safer than other martial arts styles as long as the required security measures were maintained.

Parzeller and Raschka (2003) performed a 20-year study (1981–2000) on 2,969 cases of unexpected deaths in Germany associated with sports. The findings showed no martial artists among these casualties. Instead, the greatest number of deaths were associated with soccer ($n=919$), tennis ($n=209$), and cycling ($n=187$). Thus, martial arts have been extensively investigated in several studies that analyzed different problems from different points of view.

Many of these investigations have definitively shown an improvement of the athlete's physical condition over that of people who do not practice martial arts. However, the above studies did not determine whether martial artists are healthier and more resistant to illnesses than those who do not participate in sports. Therefore, the aim of this investigation was to determine if there are additional health-related quality of life benefits observed in those who practice martial artists compared to the general population.

Method and procedure

From February 2008 to June 2009, 343 martial artists practicing 8 different martial arts styles from 24 different schools answered the German standardized questionnaire 36 (SF-36) in a controlled setting and without prior knowledge of the aim of the evaluation. To guarantee objectivity, the questionnaire was given before training in each of the schools. The authors of this paper, as well an informed fellow student who had not participated in any martial arts prior to conducting the study, supervised the procedure.

Additionally, from June 2008 to December 2008, 2,512 martial artists answered the online questionnaire found on the website www.forschung-kampfsport.de (investigation on martial arts). The IP address of each responder was recorded to increase transparency and limit the possibility of external manipulation.

Approximately 4,000 e-mails were sent to associations, schools, and individual martial artists inviting people to participate in the project. Furthermore, announcements appeared in the magazines *Fitness Tribune* and *Kampfkunst International* (Martial Arts International), as well as on the website www.kampfsport-deutschland.de (martial arts in Germany). Several associations and martial arts schools added the above link to their websites to promote the project.

The in-person questionnaire had martial artists describe themselves in regard to their health-related quality of life based on the SF-36. The SF-36 is the most frequently used international standard method of evaluating a person's

health. It contains 36 items, 35 of which belong to the following eight scales:

1. Physical operational capability (ten items)
2. Physical role function (four items)
3. Physical pain (two items)
4. Average cognition of health (five items)
5. Vitality (four items)
6. Social operational capability (two items)
7. Emotional role function (three items)
8. Psychological well-being (five items)

This questionnaire covers the multidimensionality of a person's state of health, including their psychological and physical cognition, social relations, and functional competence. Common treatments like the energetic terminal point diagnosis (Mandel 1990), blood examinations, and more involved physical methods of evaluating the participants were not used because the intent of this study was to examine a large cross section of a variety of martial arts styles in Germany. Therefore, a procedure including physical treatments would be too complex for a large sample size.

After consulting with experts in the area of illness prevention from accident and health insurance agencies, additional questions were developed and added to the SF-36 questionnaire. These questions were also answered by the participants. The use of the SF-36 questionnaire with additional questions was designed to show any gain of cognition through the practice of martial arts. The question regarding the change of the state of health in relation to the last year is not integrated in any scale and is evaluated separately (Bullinger and Kirchberger 1998, pp 51–62). Further, different criteria such as the number of participants that practiced each style of martial arts were recorded to show the demographics of the sample population. Including a variety of styles with different cultural backgrounds and histories of development into the design of the investigation was regarded as very important. Martial artists could only participate in the online survey after naming their style of martial arts.

Importantly, differences observed for martial arts styles between the in-person (present) group and the online group result from the use of a layered sample method for the present questioning procedure. The average ages in the groups were 31.9 and 30.6 years for the present ($n=343$) and online ($n=2,512$) groups, respectively, and were lower than the general population comparison group (47.6 years; $n=2,906$). The educational background was higher for the martial artists. Furthermore, there was a difference between both sexes. In the present group, 74.1% were men, 24.4% were women, and 1.5% did not specify their gender. In the online group, 74.9% were men and 25.1% were women, and in the comparison group 44.4% were men and 55.6% were women. The average amount of training performed

weekly for the present and online groups was 3.4 and 4.7 h, respectively.

Results

The mean values for the questionnaire answers for the groups individually (present and online) or combined (entire), which were weighted with respect to age, education, and sex, and the comparison group (standard) underwent *t* tests to determine significant differences between groups. The results are presented in Tables 2 and 3.

The data from the SF-36 questionnaire allow a quantitative comparison to be made of the subjective evaluation of health from the point of view of the interviewees. Compared to the general population (standard), the martial artists from both the present and online groups reported a higher degree of health and were closer to the ideal values for a healthy person. The most striking differences were observed for categories dealing with physical functions. Further, there were different results between the present and online groups and both martial artist groups and the comparison group.

Differences between the present and online groups originate from the different basic conditions and context of the questionnaire. The participants who completed the

in-person questionnaire rated their subjective health condition directly before a martial arts training session and therefore were in a different physical, hormonal, and psychological context than the online interviewees. Additionally, the participants who completed the online questionnaire did so at different times of the day. Finally, seasonal effects could have altered the results, since the present group completed the questionnaire during February–July and the online questionnaire was completed during July–December.

There were also differences in the composition of the present and online groups, as listed in Table 1. The martial art ESDO is a small association with approximately 15,000 members. ESDO refers to itself as a sport of health and defense. This group represents 16.0% of the present group and only 3.7% of the online group. Differences were also seen for those practicing karate. This particular style was practiced by 15.7% of the present group and 26.8% of the online group. In addition, 18.4% of martial artists responding to the online questionnaire practiced styles such as kickboxing or Philippine martial arts, which were not represented in the questioning of interviewees in person at martial arts schools.

On the questionnaire, the “physical function” refers to the impact a person’s physical health condition has on that person’s daily work or activity. The mean of the physical

Table 1 Martial arts representation in present and online groups

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	ESDO present	55	16.0	16.0	16.0
	ESDO online	93	3.7	3.7	3.7
	Aikido present	35	10.2	10.2	26.2
	Aikido online	200	8.0	8.0	11.7
	Wing Tsun present	37	10.8	10.8	37.0
	Wing Tsun online	228	9.1	9.1	20.7
	Judo present	39	11.4	11.4	48.4
	Judo online	197	7.8	7.8	28.6
	Jujutsu present	33	9.6	9.6	58.0
	Jujutsu online	255	10.2	10.2	38.7
	Karate present	54	15.7	15.7	73.7
	Karate online	672	26.8	26.8	65.5
	Tae kwon do present	53	15.5	15.5	89.2
	Tae kwon do online	248	9.9	9.9	75.4
	Kendo present	37	10.8	10.8	100.0
	Kendo online	156	6.2	6.2	81.6
	Philippine martial arts online	66	2.6	2.6	84.2
	Kickboxing online	80	3.2	3.2	87.4
	Kung fu online	84	3.3	3.3	90.7
	Miscellaneous online	233	9.3	9.3	100.0
Entire present	343	100.0	100.0		
Entire online	2512	100.0	100.0		

function of the present group was significantly higher (12.53) than that of the standard group ($p < 0.05$). Further, while the mean of the online group was also significantly higher (6.56) than the standard group ($p < 0.05$), the present group had an overall better score than the online group.

The “physical operational capability” provides a measure of everyday physical activities, such as self-supply, hoisting, stooping, climbing stairs, as well as medium heavy or exhausting actions. In this category, there was also a highly significant difference of 10.45 between the present group and the standard group ($p < 0.05$). The difference between the online group and the standard group was 7.59. This was also a significant difference ($p < 0.05$) but less than the present group by 2.85.

The subject areas “physical pain” and “average cognition of health” are part of the “physical amount scale.” The present group was 8.13 and 11.37 points better than the standard group for physical pain and average cognition of health, respectively. These were also significant differences ($p < 0.05$). For physical pain, the results of the online group were 1.10 better than the standard group but 7.02 worse than the present group. Further, in the average cognition of health category the online group was 7.74 better than the standard group but 3.62 lower than the present group. The difference between the online group and the standard group for the physical pain category was significant ($p < 0.05$) but for average cognition of health the difference did not reach statistical significance.

The results of the present group for the “psychological amount scale” as well as in the “health changes in comparison to the previous year” category are not as clear as those of the physical amount scale. Parts of the psychological amount scale are: vitality, social operational capability, emotional function, and psychological well-being. There was no significant difference for the psychological amount scale between the present group and the standard group ($p > 0.05$); however, there was a significant difference between the online group and the standard group ($p < 0.05$). Further, there were significant differences between the online group and the standard group for the subcategories of the psychological amount scale. Specifically, there was a 5.01 difference in emotional function ($p < 0.05$) and a 3.86 difference in psychological well-being ($p < 0.05$). There were no significant differences for the vitality and social operational capability categories for the online and present groups.

Discussion

An exemplary evaluation of the health insurance company *Innungskrankenkasse* (Guild Health Insurance Company) Baden-Württemberg, which included 753 test persons,

showed no confirmed findings but a tendency that persons using primary prevention methods had improved health-related quality of life. The longitudinal evaluation with additional questions taken from the SF-36 questionnaire could detect that all dimensions of health-related quality of life significantly improved while the persons were enrolled in exercise and relaxation courses. However, the sustainability and the stability of these effects were not evaluated (Riemann and Gläser 2001). In the “activity” primary prevention sphere used by the compulsory health insurance agencies, activities like cardiovascular training, workouts for the back and spine, walking, aqua jogging, qigong, tai chi, yoga, autogenic training, progressive relaxation of muscles, and others have been promoted. Except for qigong and tai chi, martial arts have not been recommended as primary preventive measures (TKK 2006).

The current study was conducted to determine if martial arts qualify as a primary prevention activity. The suitability of martial arts as primary prevention measures can only be recommended if people who practice martial arts are actually healthier than people who do not. However, a person’s state of health is not an easily defined concept. Rather it is a complicated interaction of many factors that require overall health to be examined from a multidimensional point of view. Thus, we developed a questionnaire that considered multiple parameters associated with health-related quality of life and considered psychological well-being, physical condition, social relations, and functional competence.

The results indicate that those who participate in any kind of martial art perceive their health-related quality of life to be better than those in the general population. However, it is necessary to look closer at the different dimensions before making an overall assessment. Compared to the standard group, who did not practice martial arts, those who practiced martial arts scored significantly better on the questionnaire overall. This result confirms the results of other studies which reported that practicing martial arts improves the person’s psychological constitution. Importantly, for the psychological assessment in the present study, significant improvement in the present group was only observed in the emotional role function and the psychological well-being categories.

A 30-year longitudinal study by Binder (2007) showed that positive psychosocial changes in people who practice martial arts were always observed. In contrast, the present study shows that a sophisticated picture of the health promoting effects of martial arts can be constructed by including a series of questions that evaluate multiple aspects of psychological well-being. We assume that there is a complex relationship between practicing martial arts regularly and any possible psychosocial benefits. For instance, Dorschner and Preuß (2005) evaluated 50 martial

artists and reported that focusing only on physical training for martial arts competitions did not provide a positive change to the athlete's psychological health. Thus, the success of a martial arts program for primary prevention may hinge on the scope of the training program. A broad program that includes social, spiritual, and physical aspects may be superior to a more narrow, purely physical training

program designed to prepare an athlete for a competition. Thus, the relationship between the practice of martial arts and improved health likely includes other influences. For instance, the ultimate goals of the training, as well as the social and occupational surroundings of the person, may have a deeper impact on their social operational capability than the physical movements of the martial arts itself.

Table 2 Comparison of standard control group with present group, online group, and combined present and online groups (entire)

	Type	<i>n</i>	Mean	Standard deviation	<i>p</i> value + sig. (1-sided)
SF-36 physical operational capability (0-100)	Standard	2,906	85.4061	22.49627	0.000
	Present	343	95.8529	7.89559	0.000**
	Online	2,512	93.0018	14.15667	0.000**
	Entire	2,855	93.3443	13.58879	0.000**
SF-36 physical function (0-100)	Standard	2,900	82.6041	32.91789	0.000
	Present	343	95.1373	16.71499	0.000**
	Online	2,512	89.1699	25.67206	0.000**
	Entire	2,855	89.8868	24.84136	0.000**
SF-36 physical pain (0-100)	Standard	2,908	78.8336	27.54676	0.000
	Present	343	86.9684	16.51923	0.000**
	Online	2,512	79.9413	23.88882	0.000**
	Entire	2,855	80.7855	23.23817	0.000**
SF-36 average cognition of health (0-100)	Standard	2,913	68.0338	20.63557	0.000
	Present	343	79.4088	11.73618	0.000**
	Online	2,512	75.7795	19.61551	0.50
	Entire	2,855	76.2156	18.87920	0.000**
SF-36 vitality (0-100)	Standard	2,894	63.2480	18.52809	0.000
	Present	343	64.6455	12.01420	0.029*
	Online	2,512	60.8065	18.15372	0.109
	Entire	2,855	61.2677	17.57287	0.183
SF-36 social operational capability (0-100)	Standard	2,913	88.8027	18.34065	0.000
	Present	343	87.6796	14.23899	0.091
	Online	2,512	88.3542	14.89307	0.000**
	Entire	2,855	88.2731	14.81522	0.000**
SF-36 emotional function (0-100)	Standard	2,902	89.4719	26.96125	0.000
	Present	343	94.4832	16.13849	0.000**
	Online	2,512	81.1596	32.00766	0.000**
	Entire	2,855	82.7603	30.84390	0.000**
SF-36 psychological well-being (0-100)	Standard	2,906	73.8195	16.76168	0.000
	Present	343	77.6868	10.25162	0.000**
	Online	2,512	70.7263	20.45838	0.000**
	Entire	2,855	71.5626	19.64588	0.000**
ROH SF-36 change of health	Standard	2,914	2.9044	0.98696	0.000
	Present	343	2.3920	0.79594	0.000**
	Online	2,512	2.4752	0.99311	0.000**
	Entire	2,855	2.4652	0.97179	0.000**

There is heterogeneity of variance within all *t* tests

Standard general population control group, *present* group who completed questionnaire in person, *online* group who completed questionnaire online, *entire* present + online groups

p*<0.05; *p*<0.001

Research on a person’s quality of life traditionally requires the person to be present, in person, and to complete a paper questionnaire. However, due to factors such as costs and time constraints, numerous studies have been adapted to utilize the Internet to collect data. One complication of this is that Internet-based data gathering can influence the subject’s answers, though most studies do not report differences among the answers given between in-person and online participants (Kongsved et al. 2007). Because of that, the present study was conducted using both questionnaires completed by participants in person and those completing an online questionnaire. These two questionnaires were administered at different times. The results were compared according to the type of questionnaire and compared individually or as a whole to a standard group (Tables 2 and 3).

The different results between the present and online groups could result from differences in the styles of martial arts practiced by the groups or differences in the participant’s behavior/activity prior to completing the questionnaire. No difference in sex or relationship status was seen between the present and online groups. However, there were behavior-related differences between the groups such as voluntary work: present 33.5% and online 45.7%; and smoking: present 7.6% and online 15%. Further, the online group practiced martial arts 1.3 h more each week, on average, than the present group. Of the online group, 78.2% practiced martial arts at a licensed nonprofit association, whereas in the present group 61.5% practiced martial arts at a licensed nonprofit association and 38.5% did so in a private school. Finally, there were religion-related differences. In the present group, 59.2% identified themselves as religious, while only 45.9% of the online group interviewees identified themselves as religious. Thus, in addition to differences in the martial arts styles, differences in behavior

and religious beliefs were observed between the groups and between those practicing a martial art and the standard group. Kral (2009) obtained similar results in a recent report examining health-related effects of karate in Austria. She concluded that the Asian concept of exercise can be used as a multiple health factor promoting instrument, which has positive effects on the complex psychosocial and psychological dimensions of overall health.

Limitations

The complex subject matter in this study represents the most significant limitation. The present investigation on a cross section of the martial arts practitioners in Germany indicates that the practice of martial arts has the potential for overall health benefits. This can only be confirmed through a longitudinal study that looks at both subjective and objective measures of health, resistance to illness, and injury rates. The SF-36 questionnaire used in this study is one of the most frequently used devices for measuring a person’s subjective quality of life. The questionnaire’s psychometric criteria, such as reliability and validity, are rated as “excellent” and are accepted as an adequate instrument for measuring a person’s health-related quality of life (Bullinger and Kirchberger 1998, p 32).

While the differences between both the present and online groups with the representative German standard sample were statistically significant, the evaluation end point was the subjective “health-related quality of life.” This is not rigorous enough to establish martial arts as a suitable primary prevention activity. Further studies that include historic, physical, and technical investigations of subjects are required to establish whether Asian martial arts are suitable as a health prevention method.

Table 3 Comparison of standard and martial artists groups’ physical and psychological amount scale—group statistics

	Type	n	Mean	Standard deviation	p value + sig. (1-sided)
Standard, physical amount scale	Standard	2,868	50.0042	10.46447	0.000
	Present	343	54.9039	4.34939	0.000**
	Online	2,512	53.9320	7.53140	0.000**
	Entire	2,855	54.0488	7.22992	0.000**
Standard, psychological amount scale	Standard	2,868	51.4362	8.34471	0.000
	Present	343	51.2193	5.34598	0.254
	Online	2,512	48.0615	10.25729	0.000**
	Entire	2,855	48.4409	9.85122	0.000**

There is heterogeneity of variance within all t tests

Standard general population control group, present group who completed questionnaire in person, online group who completed questionnaire online, entire present + online groups

*p<0.05; **p<0.001

Conclusion

The present study shows that 343 martial artists practicing 8 different styles, when questioned in person, had higher health-related quality of life scores than the average population. A greater difference was seen for physical aspects of the questionnaire than for psychological aspects. Further, 2,512 martial artists completed an online questionnaire and also had a higher health-related quality of life than the representative standard group. While both the present and online martial arts groups had a significantly better perceived health-related quality of life than the standard group, specific differences were observed between the present and online groups. Different periods of when the questionnaires were administered and differences in the composition of the groups likely account for disparities in the results. Despite these differences, the study shows that people who practice martial arts consider their health-related quality of life to be better than people who did not practice a martial art. Thus, martial arts appear to benefit a person's subjective perspective of their health.

Potential disadvantages of martial arts, such as increased violent or aggressive behavior and increased risk of injury, have been disproved by other studies. The results of this study indicate that martial arts are suitable as a primary prevention method. However, establishing that the practice of Asian martial arts improves a person's overall health must be confirmed with additional studies using objective physical and psychological parameters.

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Conflict of interest The corresponding author is a martial artist and declares that there are no conflicts of interests.

References

- Binder B (2007) Psychosocial benefits of the martial arts: myth or reality? *Int Ryuku Karate Res Soc J*
- Bitzer-Gavornik G, Unterrainer H (2006) Karate-Do und Resilienz/ Kohärenz als Ausdruck psychischer Gesundheit. (Karate-Do and mental health – The salutogenetic effects of training karate). http://www.karate-stmk.at/aktuelles/neuigkeiten_detail.php?id=00100. Accessed 14 Feb 2010
- BMBF (2006) Richtlinien zur Förderung der Präventionsforschung zur Gesundheitsförderung und Primärprävention von älteren Menschen im Rahmen des Regierungsprogramms: Forschung für den Menschen. Federal Ministry of Education and Research. <http://www.gesundheitsforschung-bmbf.de/de/1316.php>. Accessed 14 Feb 2010
- Bullinger M, Kirchberger I (1998) Handanweisung SF-36 Fragebogen zum Gesundheitszustand. Hogrefe, Göttingen
- Burke DT, Barfoot K, Bryant S, Schneider JC, Kim HJ, Levin G (2003) Effect of implementation of safety measures in tae kwon do competition. *Br J Sports Med* 37(5):401–404
- Dolin A, Popow G, Tolstikow W (1988) Kempo - Die Kunst des Kampfes - Ostasiatische Kampfsportarten. Sportverlag Berlin
- Dorschner BW, Preuß HR (2005) Kampfsport – Stärkung für Geist und Seele – Religiöse und spirituelle Aspekte verschiedener Kampfsportarten. Seminar skilled work at the Christian Secondary School in Jena
- Federal Statistical Office (2007) Health Expenditure 2007. Federal Statistical Office Bonn 2006. <http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Navigation/Statistiken/Gesundheit/Gesundheitsausgaben/Gesundheitsausgaben.psm1>. Accessed 14 Feb 2010
- Grabert KI (2001) Karate-Do und Gewaltverbrechen. Report–Psychologie 26(10) Deutscher Psychologen, Bonn
- Head Organization of Health Insurances (2008) Collective fields of action on primary prevention. <http://www.physio.de/zulassung/pp4.htm>. Accessed 14 Feb 2010
- Held A (2004) Traditionelles Taekwondo: eine Kampfkunst und ihre Wirkungen. Dissertation, Department of Sport Science, Technical University Munich. Books on Demand, Norderstedt
- Hoffmann H (2006) Untersuchung auf Aggressionswerte unter Berücksichtigung soziologischer und sportpädagogischer Aspekte in Kampfstilen mit Trefferwirkung. Dissertation, Philosophical Department IV, Institution of Sport Science, Humboldt University, Berlin
- Kongsved SM, Basnov M, Holm-Christensen K, Hjøllund NH (2007) Response rate and completeness of questionnaires: a randomized study of Internet versus paper-and-pencil versions. *J Med Internet Res* 9(3):e25
- Kral K (2009) Gesundheitsbezogene Wirkungen von asiatischen Kampfkünsten am Beispiel der Sportart Karate in Österreich. Dissertation, Sport Science Faculty, University of Vienna
- Mandel P (1990) Energetische Terminalpunkt-Diagnose. Esogetics, Sulzbach
- Parzeller M, Raschka C (2003) Auswertung von 2969 Todesfällen im Vereinsport anhand einer 20jährigen Erhebung. *Dtsch Z Sportmed* 54(7/8):144
- Riemann K, Gläser K (2001) Evaluation der präventiven Kurse der IKK Baden-Württemberg. *Prävention* 1/2001
- Rosenbrock R (2008) Primärprävention – Was ist das und was soll das?“ Serial of the group of researchers Public Health, Center of Science Berlin for Social Research (WZB). <http://skylia.wzberlin.de/pdf/2008/i08-303.pdf>. Accessed 14 Feb 2010
- SPD/Greens (2005) Draft bill of the factions Social Democratic Party of Germany (SPD) and BÜNDNIS 90/Die Grünen (Greens) in case of fortification of sanitary prevention from 15 Feb 2005, printing 15/4833
- Szabo P (2001) The psychological impact of training deprivation in martial artists. *Psychol Sport Exerc* 2(3):187–199
- Terry CL (2006) Examining the relationship between global self-worth and the domain-specific perceptions of competence for children in karate. Dissertation, Alliant International University, Fresno
- TKK (2006) Informationen über Prävention- Gesundheitskurse-Angebote- Qualität- Kostenerstattung. *Techniker Krankenkasse (TKK)*, Health insurance of engineers, Flyer 10.2/243 10/06V
- Weiser M, Kutz I, Kutz SJ, Weiser D (1995) Psychotherapeutic aspects of the martial arts. *Am J Psychother* 49:118–127
- WHO (1986) Ottawa Charter for Health Promotion. World Health Organization. http://www.euro.who.int/AboutWHO/Policy/20010827_2. Accessed 14 Feb 2010
- Zetaruk MN, Violán MA, Zurakowski D, Micheli LJ (2005) Injuries in martial arts: a comparison of five styles. *Br J Sports Med* 39(1):29–33. doi:10.1136/bjism.2003.010322, PMID: 15618336 (PubMed-indexed for MEDLINE)