

Health Effects of Sport and Volunteering in a Military Context

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Abstract

When considering military fitness, the focus must be on psychological and physiological ability, which are themselves influenced by health. Health itself is a product of several factors, as will be highlighted in the current study. To assess health and its implications in a military context, a questionnaire was administered to 555 participants during and after the 6th Invictus Games in Düsseldorf, Germany, in 2023. The study aims to highlight the effects of sport and volunteering on mental health and to assess beliefs about sports and health within a military-related population. The results showed that sports, including a sports-affine social environment, can enhance mental health and, therefore, wellbeing/life contentment (especially in females, 0.202, $p \leq 0.006$), with most participants being aware of this connection (mainly civilians, 0.371 with $p \leq 0.001$). Also, volunteering increased life contentment (0.185, $p \leq 0.001$). Differences in age and working context were observed, as was a positive effect of volunteering on mental health.

Keywords: sports, coherence, mental health, volunteering, veterans

Introduction

From 9 to 16 September 2023, the 6th Invictus Games (IG 23) for active and former soldiers with physical and psychological disabilities (veterans¹) took place in Düsseldorf, Germany. The IG 23 aimed to help the veterans recover from physical and psychological injuries sustained in combat, in addition to attempting to involve them in sports activity, military and society.

In this respect, it must be recognised that combat injuries concern societies as a whole, as they entail financial costs for the entire society in each country. This might cause a risk sensitivity regarding military conflicts within certain societies.¹

Throughout the study, the definition of sports participation was considered active play in any sports setting, as assessed by a survey question. Volunteering in the study was defined as taking part in activities in which the individual works voluntarily and without actual pay to help others, e.g. during events like the IG 23.

Health and sports performance are influenced by psychological factors such as mindfulness and resilience.²⁻⁹ In the context of the IG 23, it is notable that resilience, which is connected to self-efficacy,

has a positive effect on the severity and outcome of post-traumatic stress disorder,⁵ while self-efficacy is linked to sports performance.¹⁰ In this respect, factors are interdependent; it does not matter whether physical or mental training is applied, both result in positive effects on mental health.^{2,6,9,11} Veterans can profit twofold in this context.

Mental health, which according to the WHO enables an individual to perform according to their ability, cope with daily life stressors, work productively and contribute to society,¹² is not only related to working conditions,¹³⁻¹⁵ but also, via factors like meaning and manageability, to a sense of coherence¹⁶ and perceived self-efficacy.¹⁷

The ability to cope with stressors is influenced by available resources.¹⁸ Psychosocial factors such as sleep, religion, financial situation and social environment can serve as resources or stressors,¹⁴ with these findings transferable to military personnel as well. The sense of coherence, according to Singer & Brähler,¹⁶ is of great importance in this respect.

Research question

The question arises whether sport is beneficial to mental and, therefore, overall health in general and within distinct participant groups, and whether the same holds for volunteer activity. In addition, the study aims to answer the question: What role do selected personal beliefs about health play in mental health?

1 For reasons of readability, throughout the article the term ,veterans will be used to describe active and former soldiers with physical and psychological disabilities, but not unimpaired soldiers.

Materials and methods

The survey was conducted during and after the 6th Invictus Games 2023 in Düsseldorf, Germany. Survey participants received an invitation to complete the questionnaire via email; the survey was conducted via SoSci Survey with questions in German and English. The questionnaire consisted of 130 questions, developed by the Center for Military History and Social Sciences of the German Armed Forces, based on questionnaires from previous Invictus Games events. A list of the questions used in the study is provided below. All participants granted informed consent, and all research complied with the Helsinki declaration.

A set of factors was tested for differences between genders, age groups and occupations (military personnel, civilian personnel, civilian rescue workers), as well as for function during the IG 23 (volunteers, spectators, athlete support, athletes) using one-way ANOVA and Scheffé post hoc tests. Within each of the abovementioned functional roles, a specific set of questions was also assessed. However, results for these questions were calculated only for volunteers because the other functional roles had too few respondents. Also, Spearman's Rho has been calculated to assess the correlation between factors.

List of factors/statements:

- Life seems understandable/ordered, follows specific rules (coherence).
- Life seems to be manageable, alone or with help from others (manageability).
- Life is worth it, makes sense and is fun (meaning).
- In general, I am content with my life as it is (contentment).
- I have a general interest in sport.
- I actively play sports.
- My social environment is also interested in sports.
- Sport is very important in my life.
- Those who train with me are important to me.
- Sport is important for my health.
- Sport influences my mental condition.
- Physical and mental health are connected.
- Sport can provide orientation during PTSD.
- Specific factors/statements for volunteers:
 - Volunteering makes me feel important.
 - Volunteering enhances my feeling of self-worth.
 - Volunteering makes me feel needed.

- Volunteering enhances my wellbeing.
- My nearest social environment values volunteering.
- My social environment is also interested in volunteering.

The Spearman coefficient was used because of its ability to assess nonlinear relationships.¹⁹ Values ≥ 0.1 were seen as weak correlation, ≥ 0.3 as middle and ≥ 0.5 as high²⁰. Correlations were calculated separately for gender and occupation, but only for data with sufficient homogeneity of variance to eliminate artefacts arising from heterogeneous groups, e.g. too many nationalities. Organisation and context of sport activities within a country (school, university, clubs, self-organised, etc.) vary across European countries^{2,22} and are subject to constant change, e.g. due to digitalisation,²³ while Germany might offer better possibilities for (rehabilitative) sports due to a better national health system.²⁴ It is important to note that in the German Armed Forces, the Invictus Games are part of the rehabilitation process.

It must be noted that results might deviate by up to 4.12 % due to an insufficient sample size in the overall sample and by up to 5.25 % for volunteers.²⁵ Because 115 survey participants did not provide information regarding their functional role within the IG 23 (volunteer, spectator, athlete support, athlete), results were not calculated separately within functional role subgroups, except for volunteers regarding aspects of volunteering. Statistical power Analysis was calculated using GPower 3.1.9.7; due to participants not providing information regarding their functional role during the IG 23, sufficient statistical power and representativeness could not be achieved within subgroups except for volunteers. Results were calculated for factors with a sufficient number of respondents; significance was set at $p \leq 0.05$ and a by-tendency significance for $p \leq 0.1$. Results without a clear distinction between groups were not reported, as well as results with $\eta < 0.1$, while $\eta \geq 0.1$ was interpreted as a weak effect, ≥ 0.24 as a medium effect and ≥ 0.37 as a strong effect.²⁰ All calculations were done with SPSS 29.

Results

The overall sample consisted of $N = 555$ aged 21 or younger to over 60, of whom 349 were volunteers, 68 spectators, 19 athlete support and 4 athletes, while 115 did not provide their functional role during the games. The majority of volunteers were female (56 %), middle-aged (46 % between 41 and 60), German (79 %), academics (59 %) and had a spouse or partner (66 %).

Table 1: Differences between factors for different groups

Differences by gender		N	Mean	SD	p	η
Life is worth it, makes sense and is fun.	Male	181	1.73	1.010		
	Female	190	2.04	1.351		
	Total	371	1.89	1.205	0.014	0.126
Differences by age		N	Mean	SD	p	η
Life is worth it, makes sense and is fun.	Below 21	3	1.33	0.577		
	21 to 30	63	2.08	1.248		
	31 to 40	62	1.68	.883		
	41 to 50	75	2.15	1.504	0.093	
	51 to 60	104	2.00	1.344		
	Over 60	68	1.53	0.657	0.093	
	Total	375	1.90	1.211	0.013	0.195
In general, I am content with my life as it is.	Below 21	3	2.67	0.577		
	21 to 30	61	2.48	1.299	0.005	
	31 to 40	62	2.27	1.074	0.077	
	41 to 50	75	2.44	1.287	0.004	0.251
	51 to 60	104	2.08	1.312		
	Over 60	69	1.62	0.730	0.005/.077/.004	
	Total	374	2.17	1.206	0.000	0.251
Differences by status: civilians working in rescue, civilians not working in rescue, military personnel		N	Mean	SD	p	η
I am actively playing sports.	Rescue	19	2.37	1.012	0.055	
	Military	188	1.79	0.922	0.055	
	Civil	168	1.99	1.055		
	Total	375	1.91	0.996	0.021	0.145
Sport is important for my health.	Rescue	19	2.00	1.106	0.017	
	Military	187	1.48	0.706	0.017	
	Civil	169	1.61	0.765		
	Total	375	1.56	0.764	0.009	0.500
Differences by function within the IG 23		N	Mean	SD	p	η
Life seems to be manageable, alone or with help from others.	Spectators	56	2.34	0.880	0.008	
	Volunteers	308	2.52	1.201	0.017	
	Athletes	4	1.75	0.500	0.038	
	Supporters	9	3.78	1.202	0.008/.017/.038	
	Total	377	2.51	1.172	0.004	0.141
Life is worth it, makes sense and is fun.	Spectators	56	1.70	0.913	0.013	
	Volunteers	307	1.91	1.237	0.032	
	Athletes	4	1.25	0.500	0.084	
	Supporters	9	3.11	1.453	0.013/.032/.084	
	Total	376	1.90	1.210	0.008	0.190
Sport is important for my health. (No distinct values in Scheffé)	Spectators	61	1.36	0.708		
	Volunteers	329	1.59	0.748		
	Athletes	4	1.00	0.000		
	Supporters	13	1.77	0.832		
	Total	407	1.56	0.747	0.043	0.176

One-way ANOVA showed differences between female and male participants for ‘Life is worth it, makes sense and is fun’. ($p \leq 0.014$, $\eta = 0.126$, see table 1) as well as differences between age groups for ‘Life is worth it, makes sense and is fun’ (older vs middle-aged participants, $p \leq 0.013$, $\eta = 0.195$), and life-related contentment rose with age ($p \leq 0.000$, $\eta = 0.251$). It has to be noted that female and male participants were equally aware of the connection between sports participation and the treatment of PTSD.

Civilian rescue workers should be considered separately from civilian participants and military personnel because results differ across the three groups. When considered together, the data lacked homogeneity of variance, and correlations differed between the three groups (see below). Unfortunately, only very few civilian rescue workers participated in the IG 23 and, therefore, in the study. One-way ANOVA showed significantly lower sports activity

among civilian rescue workers than among military personnel ($p \leq 0.021$, $\eta = 0.145$).

Correlations with Spearman’s Rho (ρ) were calculated for selected factors across the following subgroups: females, males, military personnel, civilian participants and civilian rescue personnel (see tables 2, 3 and 4). For male participants, sports activity did not correlate with any of the life-coherence factors, and understandability did not correlate with any other factor (see table 3). For female participants, there were correlations between sports activity and all four factors: understandability ($p \leq 0.024$, $p = 0.165$), manageability ($p \leq 0.036$, $p = 0.153$), contentment ($p \leq 0.006$, $p = 0.202$), and, by trend, meaning ($p \leq 0.052$, $p = 0.142$). The sports affinity of the social environment showed a stronger connection to one’s own sports affinity in males than in females ($p = 0.000$, $p = 0.542$, $p = 0.000$, $p = 0.443$). Correlations among civilian rescue workers differed

Table 2: Correlations for volunteers between sports-factors, volunteering and coherence factors

		General interest in sport	I actively play sports	Life seems understandable and ordered; the world follows specific rules	Life seems to be manageable, alone or with help from others	Life is worth it, makes sense and is fun	In general, I am content with my life as it is
General interest in sport	rho	1.000	0.586	0.101	0.139	0.079	0.069
	p	.	0.000	0.050	0.007	0.125	0.181
	N	416	406	376	376	375	374
I actively play sports.	rho	0.586	1.000	0.035	0.147	0.127	0.200
	p	0.000	.	0.542	0.010	0.026	0.000
	N	406	406	306	306	305	304
Volunteering makes me feel important.	rho	0.016	-0.077	0.073	0.041	-0.022	-0.111
	p	0.768	0.168	0.202	0.481	0.700	0.053
	N	0329	324	304	304	303	302
Volunteering enhances my feeling of self-worth.	rho	-0.056	-0.118	0.114	-0.056	-0.014	-0.142
	p	0.307	0.033	0.046	0.325	0.804	0.013
	N	331	326	306	306	305	304
Volunteering makes me feel needed.	rho	-0.062	-0.087	0.147	0.023	0.059	-0.031
	p	0.259	0.117	0.010	0.684	0.309	0.595
	N	330	325	305	305	304	303
Volunteering enhances my wellbeing.	rho	-0.031	-0.103	0.151	0.131	0.129	-0.049
	p	0.574	0.063	0.008	0.022	0.025	0.394
	N	329	324	305	305	304	303
My nearest social environment values volunteering.	rho	0.089	0.091	0.133	0.035	0.090	0.141
	p	0.107	0.103	0.020	0.539	0.119	0.014
	N	328	323	304	304	303	302
My social environment is also interested in volunteering.	rho	0.159	0.128	0.153	0.200	0.133	0.185
	p	0.004	0.022	0.008	0.000	0.020	0.001
	N	328	323	303	303	302	301

strong correlation; weak correlation; significant result; tendency for significance

Table 3: Correlations between selected factors for male and female participants.

	Male						Female					
	General interest in sports	I actively play sports	Life seems understandable/follows certain rules	Life seems to be manageable, alone or with help from others	Life is worth it, makes sense and is fun	In general, I am content with my life as it is	General interest in sports	I actively play sports	Life seems understandable/follows certain rules	Life seems to be manageable, alone or with help from others	Life is worth it, makes sense and is fun	In general, I am content with my life as it is
General interest in sports	1,000	,611	,012	,095	,081	,080	1,000	,555	,184	,179	,066	,067
	.	,000	,876	,202	,277	,286	.	,000	,011	,013	,369	,360
	183	182	181	181	180	180	196	194	190	190	190	189
I actively play sports.	,611	1,000	-,025	,107	,089	,177	,555	1,000	,165	,153	,142	,202
	,000	.	,738	,149	,231	,017	,000	.	,024	,036	,052	,006
	182	183	182	182	181	181	194	194	188	188	188	187
My social environment is also interested in sports.	,542	,558	,086	,189	,165	,083	,433	,436	,245	,202	,170	,121
	,000	,000	,250	,011	,027	,266	,000	,000	,001	,005	,019	,099
	181	182	181	181	180	180	195	194	189	189	189	188
Sport is of high importance in my life.	,741	,794	-,001	,148	,077	,148	,630	,794	,240	,190	,140	,150
	,000	,000	,992	,046	,304	,047	,000	,000	,001	,009	,055	,040
	181	182	181	181	180	180	195	194	189	189	189	188
Those who train with me are important to me.	,371	,337	,037	,201	,075	,026	,341	,450	,226	,210	,108	,112
	,000	,000	,621	,007	,318	,729	,000	,000	,002	,004	,139	,127
	182	183	182	182	181	181	194	193	188	188	188	187
Sport is important for my health.	,257	,305	,059	,289	,239	,210	,005	,172	,240	,248	,160	,204
	,000	,000	,430	,000	,001	,004	,944	,017	,001	,001	,027	,005
	182	183	182	182	181	181	196	194	190	190	190	189
Sport influences mental condition.	,357	,489	,039	,231	,256	,129	,248	,353	,070	,230	,243	,153
	,000	,000	,602	,002	,001	,084	,000	,000	,340	,001	,001	,036
	182	183	182	182	181	181	195	194	189	189	189	188
Physical and mental health are connected.	,035	,143	,046	,151	,135	,083	,150	,058	,133	,215	,229	,086
	,640	,053	,540	,042	,069	,266	,037	,422	,070	,003	,002	,241
	182	183	182	182	181	181	194	192	188	188	188	187
Sport can provide orientation during PTSD.	,084	,099	-,021	,284	,315	,232	,152	,039	,118	,176	,188	,166
	,261	,184	,782	,000	,000	,002	,035	,592	,107	,016	,010	,024
	181	182	181	181	180	180	193	191	187	187	187	186

strong correlation; moderate correlation; weak correlation; significant result; tendency for significance

Table 4: Correlations for selected factors in military personnel, civilian rescue workers and civilian participants.

	Military personnel						Civilian participants						Civilian rescue personnel					
	General interest in sports	I actively play sports	Life seems under-standable/ordered, follows specific rules	Life seems to be manageable, alone or with help from others	Life is worth it, makes sense, is fun	In general, I am content with my life as it is	General interest in sports	I actively play sports	Life seems under-standable/ordered, follows specific rules	Life seems to be manageable, alone or with help from others	Life is worth it, makes sense and is fun	In general, I am content with my life as it is	General interest in sports	I actively play sports	Life seems under-standable/ordered, follows specific rules	Life seems to be manageable, alone or with help from others	Life is worth it, makes sense and is fun	In general, I am content with my life as it is
General interest in sports	1,000	,655	,001	,133	,095	,094	1,000	,522	,207	,131	,025	,051	1,000	,656	,224	,118	,438	,024
		,000	,986	,069	,196	,201		,000	,008	,095	,748	,516		,002	,356	,631	,060	,924
	188	188	187	187	186	186	169	167	164	164	164	164	19	19	19	19	19	18
I actively play sports.	,655	1,000	,008	,161	,198	,199	,522	1,000	,133	,113	,019	,181	,656	1,000	-,027	,010	,187	-,047
	,000		,912	,028	,007	,006	,000		,091	,149	,809	,021	,002		,912	,967	,443	,853
	188	188	187	187	186	186	167	168	163	163	163	163	19	19	19	19	19	18
My social environment is also interested in sports.	,532	,539	,132	,244	,207	,134	,454	,432	,203	,153	,109	,053	,520	,724	,185	,127	,228	-,089
	,000	,000	,073	,001	,005	,069	,000	,000	,009	,050	,163	,503	,023	,000	,449	,605	,347	,724
	187	187	186	186	185	185	168	168	164	164	164	164	19	19	19	19	19	18
Sport is of high importance in my life.	,697	,791	,032	,172	,166	,164	,685	,802	,183	,177	,001	,125	,829	,747	,359	-,048	,392	-,017
	,000	,000	,661	,019	,024	,025	,000	,000	,019	,023	,994	,111	,000	,000	,132	,846	,097	,946
	187	187	186	186	185	185	168	168	164	164	164	164	19	19	19	19	19	18
Those who train with me are important to me.	,350	,370	,031	,170	,033	,031	,367	,403	,225	,236	,129	,104	,507	,499	,318	,179	,162	,003
	,000	,000	,675	,021	,660	,680	,000	,000	,004	,002	,099	,184	,027	,030	,185	,462	,507	,991
	187	187	186	186	185	185	168	168	164	164	164	164	19	19	19	19	19	18
Sport is important for my health.	,157	,275	,111	,297	,154	,146	,088	,175	,163	,271	,214	,270	,127	,302	,088	,037	,286	,363
	,032	,000	,130	,000	,036	,047	,256	,024	,036	,000	,006	,000	,606	,209	,720	,880	,236	,139
	188	188	187	187	186	186	169	168	165	165	165	165	19	19	19	19	19	18
Sport influences mental condition.	,414	,523	,091	,283	,268	,137	,229	,371	-,027	,189	,194	,145	,147	,048	,136	,372	,436	,264
	,000	,000	,218	,000	,000	,062	,003	,000	,735	,015	,013	,064	,547	,844	,578	,117	,062	,290
	188	188	187	187	186	186	168	168	164	164	164	164	19	19	19	19	19	18
Physical and mental health are connected.	,164	,171	,085	,164	,110	,039	,096	,051	,055	,184	,213	,098	-,276	-,153	,189	,062	,125	,022
	,025	,019	,246	,025	,134	,596	,218	,515	,489	,019	,006	,212	,253	,532	,438	,800	,609	,931
	188	188	187	187	186	186	167	166	163	163	163	163	19	19	19	19	19	18
Sport can provide orientation during PTSD.	,129	,115	-,013	,264	,191	,107	,124	-,006	,092	,158	,244	,222	,185	,344	,075	,310	,453	,640
	,078	,116	,858	,000	,009	,147	,112	,941	,243	,044	,002	,005	,449	,149	,761	,197	,051	,004
	187	187	186	186	185	185	166	165	162	162	162	162	19	19	19	19	19	18

strong correlation; moderate correlation; weak correlation; significant result; tendency for significance

from those among civilian participants and military personnel, with only a few participants working in civilian rescue. It is notable that, in contrast to civilian participants and military personnel, civilian rescue workers who are content with their lives also see the beneficial effect of sports activity on PTSD ($p \leq 0.001$, $p = 0.709$). At the same time, civilian rescue workers who are interested in and actively playing sports gave sports a high amount of importance in their lives ($p = 0.000$, $p = 0.829$, $p = 0.000$, $p = 0.747$), with correlation coefficients above those of military personnel ($p = 0.000$, $p = 0.791$, $p = 0.000$, $p = 0.697$) and civilian participants ($p = 0.000$, $r = 0.802$, $p = 0.000$, $p = 0.685$). Opinions related to sports were less strongly correlated with meaning in life among military personnel than among civilian participants, whereas understandability was higher among civilian participants. For military personnel, there were stronger connections between their own sports activity and the social environment than for civilian personnel (see table 4).

Volunteers showed correlations between sports activity, interest in sports, volunteering and coherence factors, as well as between coherence factors and volunteering activity in their social environment. Also, sports and volunteering in the social environment were connected (see table 4).

The research questions can be answered as follows:

- In study participants, sports activity is indeed beneficial to mental health, as has been shown by correlations between the resilience-related factors, meaning, manageability, coherence and contentment on the one hand and sports-related factors on the other (see tables 3 and 4).
- Also, resilience-related factors correlate with volunteering-related factors (see table 2) and thus hint at connections between volunteering and mental health.
- As expected, mental health (resilience) is also related to personal beliefs about health (see tables 3 and 4).

Discussion

Study limitations include the small number of participants, particularly given the military context. What can be said is that none of the civilian participants or civilian rescue workers have worked with the military before. Also, the fact that 115 survey participants did not disclose their functional role during the IG 23 led to too few results within subgroups and thus no calculations in this direction.

Differences between female and male participants regarding the meaning of life show a slightly

stronger sense of meaning in females. This could be because females are more prone to depression,²⁶ although there might be a tendency for depression in male patients being overlooked due to symptom characteristics in this patient group.²⁷ Also, it is known that males and females react differently to illnesses.²⁸

Correlations show that the social environment of male participants was more sports-affine than that of females (table 3). At the same time, for male participants, sports activity was more strongly associated with sports activity in their social environment. On the other hand, male participants did not seem to benefit mentally from these circumstances, as they showed no correlations whatsoever between sports activity and coherence factors, except for interest in sports and contentment, and the understandability of life did not correlate with any of the other sports-related factors. In contrast, among female participants, all coherence factors were associated with sports activity. Women probably derive more positive effects for their mental health from sports activity, despite not tying sports to their social environment as much as men.

Age-related differences in meaning and contentment could be caused by different daily life challenges within age groups, as well as by different life situations, e.g. financial situation, amount of free time or social contacts. Older participants reported greater meaning and contentment than middle-aged participants. Previous literature indicates that the determinants of life contentment vary with age.²⁹

Results for civilian rescue workers must be interpreted with caution due to the small sample size. Insofar as there are results, these show distinct differences regarding sports activity and opinions about sports and health (table 1). However, civilian rescue workers value the beneficial effect of sports activities on PTSD higher than military personnel or civilian participants (table 4). There may be differences in debriefing after traumatic situations between civilian rescue forces and the military. Also, civilian rescue workers were part of the German team for the first time in 2023. However, they were not in any other national team, and the civilian rescue workers surveyed probably knew that the IG 23 were part of the rehabilitation process for German athletes. Sports activity and interest were more closely linked among civilian rescue workers than for military personnel or civilian participants. This raises the question of which obstacles arise for military personnel and civilian participants in this context, and whether these obstacles may be duty- or work-related. Strong correlations between sports activity and interest in sports among military

personnel, on the one hand, and the importance of sports to the individual, on the other, suggest a positive effect of a sports-affine environment on sports activity among military personnel. It is known from previous literature that social surroundings influence frequency of sports participation.³⁰

Volunteers demonstrated a connection between sports and mental health, as well as between volunteering and mental health. This effect is enhanced by the volunteering activities in their social environment, making both sports and volunteering healthy activities, mainly when attended to with others. This is in line with previous findings.^{31,32,33,34}

The beneficial effect of sports activity on veterans' mental health aligns with previous findings.³⁵ Current findings show beneficial effects of sports and

volunteering on mental health, as well as the effect of individual beliefs on mental health and differences in this respect across participant groups.

Military fitness is staying fit on duty and regaining fitness after accidents on duty. Participants in different groups varied in their opinions regarding sport and health. Also, different participant groups displayed individual benefits from and attitudes towards sports. This must be taken into account when compiling health programmes within and out of military contexts.

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