

## Pedagogical conditions of motor training of junior volleyball players during the initial stage

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### Abstract:

Purpose: to determine pedagogic conditions effectiveness increase in junior volleyball players' training to volleyball techniques. Material: in experiment 16 boys and 9 girls participated n=25, age – 10–11 years). All participants attended volleyball circle on initial stage of training. Results: main principles of junior sportsmen motor training have been presented and required conditions of successful technical training elucidated. Main priorities of junior volleyball players' motor training process have been found. Methodic of junior volleyball players' volleyball technical training was determined. Conclusions: in motor training it is important to ensure high quality of verbal, visual and kinesthetic information. The training shall be conducted in close connection with training of physical and psycho-motor qualities as well as it is necessary to ensure positive emotional inter-relations between coach and junior sportsmen.

**Key words:** volleyball, technique, disciple, pedagogue, training, exercises, motivation.

### Introduction

One of central problems of sport training theory and methodic is perfection of motor actions' effectiveness in conditions of extreme sport functioning. Especially difficult this task is in volleyball. Here motor actions shall correspond to various space-time structure (Beliaev, 2005; Zhelezniak, Portnov, & Savin, 2001; Bykov, 2012) It was found that in sport practice insufficient attention is paid to developing, advancing training (Pashkova, 2009; Markov, & Nikolaeva, 2013). Traditional volleyball training methodic is based on learning motor actions in strictly regulated conditions. Training process, with it, is of mainly reproducible character. Coach's and sportsman's personalities, as a rule, are not taken in consideration. It fixes fulfillment of motor actions in definite typical conditions, but seriously hinders their generalization and application in non standard situations.

In training of different age children important place is engaged by techniques' training and perfection. As far as in such age periods motor function is rather on high level, the functioning of other human signal system is activated. All these create favorable conditions for formation of motor skills (Zhelezniak, 1988; Marques, Ribeiro, & Amandio, 2010).

Mastering of every motor action starts from formation of knowledge about motor tasks' sense and ways of its solution. Such knowledge is formed on the base of observation over sample performance with appropriate comments. It attracts disciple's attention to those elements off motor action, which influence on its success. (Bogen, 1985). The author called objects, requiring concentration of attention for motor action's fulfillment, "main basic points" (MBP). Combination of main basic points in action's program is called "approximate base of action" (ABA). In other research (Liakh, 2005), it is noted that ABA is a subjective category. It exists in conscious or subconscious of a disciple. Action's success depends on ABA completeness and its correspondence to objectively existing conditions of task's fulfillment. In not organized training or in training by trial and error method disciple defines MBP independently, most frequently occasionally. Bogen M.M. (Bogen, 1985) says that in case of ABA formation out of pedagogic influence training process takes very long time period. If ABA formation is controlled by coach, it points for junior sportsman how to find correct MBP. Then, time of ABA formation shortens many times. Accordingly, quality of training increases and its period reduces.

Formation of every action's MBP shall include visual image of motor task and method of its solution. Then logical image shall be provided (based on explanation). Further, kinesthetic image shall be ensured, based on earlier formed ideas (motor experience) and senses. They appear in attempts to solve motor task partially and in the whole (Gavardovskij, 2007; Liakh, 2007). When required knowledge and complete ideas of every MBP are formed then it will be possible to fulfill action in the whole on complete and understood in all main basic points, approximate foundation. To make MBP formation easier appropriate exercises are used. In multiple fulfillment of these exercises disciple fixes attention on MBP and understands motor image. Without it

construction of ABA is impossible. For better mastering the task disciple shall pronounce aloud all ABA scheme. It helps him to remember the sequence of operations' fulfillment and control; not to omit any MBP (Liakh, 2005; Brisikin, Pityn, & Zadorozhnaya, 2013).

As Bogen M.M. (Bogen, 1985) notes, successfulness of motor training depends on pre-conditions for mastering training program. The first pre-condition is disciple's physical fitness. It is connected with the fact that motor task requires certain physical qualities. Before training it is necessary to determine junior sportsmen's physical qualities. If they are insufficient for the planned motor tasks, it is necessary to plan the period of preliminary physical training. The next pre-condition is coordination fitness, formed on the base of previous motor experience. The richer motor experience is the higher will be probability of disciple's new action understanding. It will permit to quicker form approximate base of new action and appropriate motor skills (Zhelezniak, 1988; Gaverdorvskij, 2007). The third pre-condition is psychic readiness. Its base is motivation for training. The required motivation structure shall be formed with pedagogue's active participation as the main condition of motivation's formation in disciple's involvement in appropriate activity (Beliaev, 2005; Krucevich, & Vorob'ev, 2005; Driukov, 2015; Kozina et al., 2016a).

In motor training it is necessary to point at special aspects of this process organization in respect to different age junior sportsmen. Word is the main tool of new knowledge delivery to any disciples' contingent. It shall be combined with motor action's demonstration. However, correlation of demonstration and comments is quite different for different age sportsmen (Chernenko, 2015). In work with junior sportsmen, at initial stage word shall be bright and impressive, while demonstration – specific and expressive. In such age children think with the help of objects and speech images. That is why instructor shall base on this peculiarity of children's thinking (Leporace et al., 2013; Al-Ravashdeh, Kozina, Bazilyuk, & Ilnickaya 2015).

Modern requirements to elite sportsmanship require new ways for rising junior sportsmen's training already at initial stage. One of such ways can be programmed training (Farfel', 2011; Bykov, 2012). In it learning material and disciples' activity are divided into "portions" and "steps". After every step disciple's mastering of the latest portion of skills is tested. It ensures adjustment of training quickness to disciples' individual features.

Special aspects of volleyball motor training are regarded from several positions (Zhelezniak, 1988; Zhelezniak, Portnov, & Savin, 2001). The authors pay attention to demand in favorable age usage (10-12 years) for mastering the game techniques. In the first year of trainings it is necessary to train not high quantity of techniques (first of all low service hit; pass from above and from below). It shall be realized up to the level that children should unmistakably use them in game. Alongside with it, with the help of auxiliary and preparatory exercises children acquire coordination base for more successful mastering other techniques. Other important tasks are: rising of motor skills' level, which are the most important in volleyball; acceleration of formation of junior volleyball players' motor skills (Zhelezniak, Portnov, & Savin, 2001; Beliaev, 2005).

In the process of junior volleyball players' motor training special place shall be taken by imitation exercises and exercises on simulators (Iermakov, 2001; Chernov, 2007). They permit for junior sportsmen to understand the technique of the fulfilled exercise and make easier their mastering. Such means also ensure effective coordination between motor and vegetative functions, increase effectiveness of functional potential realization in competition exercise. Training successfulness to large extent depends on emotional state and, even, on separate feelings, which exist between instructor and disciple (Liakh, 2005; Gaverdorvskij, 2007). Disciple respects his coach and perceives all his information and advises. Coach appreciates his disciple and selects auxiliary and preparatory exercises more carefully, as well as means of influence on disciple. Positive relations between instructor and disciple are the basis of quick and reliable training.

In other studies importance of junior sportsmen's individual features consideration in the process of volleyball techniques' formation is shown (Boichuk, & Korop, 2008). Significance of coordination and other psycho-physiological abilities for quick mastering of motor actions with high quality is found (Boichuk, 2014). The program of such abilities' development in sport games training process was worked out and its pedagogic effectiveness was experimentally tested (Boichuk, 2015). Of not less importance are the following aspects:

- Integral assessment of volleyball players' fitness (Shchepotina, 2015);
- Formation of theoretical knowledge and motivation component of training (Bondar, 2015);
- Assessment of mental operations' quickness and their efficiency (Salatenko, & Dubinskaya, 2015; Nosko, Razumeyko, Iermakov, & Yermakova, 2016);
- Level of sensor-motor coordination and kinesthetic information (Zaporozhanov, & Boraczynski, 2015; Boloban et al., 2016);
- Application of tests in compliance with schoolchildren's age (Khudolii, Iermakov, & Ananchenko, 2015; Kopeikina, Drogomeretsky, Kondakov, Kovaleva, & Iermakov, 2016) and gender distinctions (Khudolii, Iermakov, & Prusik, 2015; Bliznevsky et al., 2016; Ivashchenko et al., 2016a, 2016b);
- Consideration of training subjects' emotional tension and their reaction to physical load (Iermakov, Podrigalo, & Jagiello, 2016; Kozina et al., 2016a, 2016b; Podrigalo, Iermakov, Rovnaya, Zukow, & Nosko, 2016; Pomeshchikova et al., 2016);
- Optimization of physical load in compliance with requirements of sport training theory (Iermakov et al., 2016; Korobeynikov, Korobeynikova, Iermakov, & Nosko, 2016; Kozina, Iermakov, Kuzmin, Kudryavtsev, & Galimov, 2016; Pryimakov, Iermakov, Kolenkov, Samokish, & Juchno, 2016).

Thus, all above delivered proved purposefulness of further studies, devoted to increase of junior volleyball players' motor training effectiveness.

**Hypothesis:** it is assumed that new means of increase of technical elements' formation effectiveness will facilitate optimization of junior volleyball players' training at initial stage. Besides, it will facilitate increase of disciples' interest to volleyball trainings and their further sport perfection.

**The purpose of the research:** is to determine pedagogic conditions effectiveness increase in junior volleyball players' training to volleyball techniques.

**Material and methods:**

*Participants:* in experiment 16 boys and 9 girls participated (n=25, age – 10–11 years). All participants attended volleyball circle on initial stage of training. The parents of junior sportsmen gave written consent for their children's participation in the research.

*Organization of the research:* for disciples' psycho-motor abilities assessment the following indicators were used: motor memory, ability for motor reproduction, assessment and differentiation of space, time and dynamic motor parameters (Sergiienko, 2001). Technical fitness was determined by quality of mastering the following: ball pass by both hands from above and from below; low direct ball service (Zhelezniak, 1988). The following tests were used in the research:

*Test 1:* accuracy of assessment and measuring motor space parameters was registered with the help of specially made calibrated screen, which worked as kinematic meter (Sergiienko, 2001). The trainee received task: in repeated attempt to measure amplitude of (0.5) from reference movement in shoulder joint in frontal plane. Movements were fulfilled without visual control by convenient for the trainee arm in such position that shoulder joint would be at the level of calibrated semi-circle center. The trainee was not informed about accuracy of reproduced movements. Error was registered by comparing the reproduced movement with actually set one. Mean absolute value of reverse proportion characterized the accuracy of assessment and measuring of movements' amplitude.

*Test 2:* accuracy of reproduced movements was realized in the same conditions like in the previous test. The trainee, without visual control reproduced the value of angle traveling 40–80° after previous reference attempt. Mean value of error was considered.

*Test 3:* accuracy of amplitudes' differentiation was determined by the value of traveling, comparing with the set value (to the side of increase), which the trainee was able to reproduce.

*Test 4:* for accuracy of time intervals' reproduction. The trainee received task to measure time interval and reproduce it without visual control (Sergiienko, 2001).

*Test 5:* for accuracy of time intervals assessment and measurement. The trainee received task to measure the set interval and reproduce 0.5 from it without visual control.

*Test 6:* for accuracy of time intervals' differentiation. It was tested by single measuring of minimal increase, comparing with reference interval at 1<sup>st</sup> and 2<sup>nd</sup> seconds. Mean value of additions to the set time interval was determined.

*Test 7:* for accuracy and measuring muscular effort, which was registered with the help of hand medical dynamometer (Sergiienko, 2001). The trainee, in standing upright position, with stretched aside arm demonstrated maximal force. In the following attempts he received task to manifest muscular effort of 0.5 from maximal. In reverse proportion this indicator characterized accuracy of assessment and measuring of efforts.

*Test 8:* for accuracy of muscular efforts reproduction the trainee receives the task to fulfill the set effort without special tension. After its registration, the trainee reproduced this effort five times. The accuracy of reproduction was characterized by deviation from the set value.

*Test 9:* for assessment of power differentiated threshold, which was estimated in analogous way. The trainee was given the task to choose optimal effort value and reproduce the least its increase in he next attempt.

*Test 10:* assessment of motor memory was fulfilled with the help of exercise with complex coordination. The exercise was of cyclic character with criss-cross coordination and fulfilled with change of plane (Sergiienko, 2001). Initial position (i.p.): right arm shall be directed aside, left – downward; 1 – right arm goes downward, left – forward; 2 – right arm goes forward, left arm – downward; 3 – right arm goes downward, left – aside; 4 – i.p. The exercises considered to be mastered, if it was fulfilled five times. Result was determined by quantity of attempts, pent for mastering the exercise.

*Test 11:* assessment of disciple's ability for kinesthetic differentiation was fulfilled with the help of test "Ball throws to target, in position "back directed to target"" (Sergiienko, 2001). Test equipment: measuring tape, 6 tennis balls, 1hula hoop, 1 filled ball (mass – 1 kg), 1 gymnastic mat (2 x 1 m). The trainee stands behind the line of throw with back directed to target. His task is to throw ball above head or shoulder and hit the target (gymnastic mat) at distance of 2 meters. In the center of gymnastic mat hula hoop (80 cm diameter) was located, inside which filled ball was. After explanation and demonstration the trainee was given one trial attempt and five control attempts. Every hit to gymnastic mat cost 1 point. Hit inside hula hoop – 2 points. Hit between hula hoop and filled ball – 3 points; hit to filled ball – 4 points.

Determination of successfulness of junior sportsmen's mastering volleyball techniques was realized as per recommendations (Zhelezniak, 1988). We chose the following tests:

1. Ball pass by two arms over head in circle of 3 meters diameter; the height of pass – 1.5 meters (quantity of passes);
2. Ball pass by two arms from below over head in circle of 3 meters diameter; the height of pass – 1.5 meters (quantity of passes);
3. Ball passes to the left or to the right half of site, 10 attempts (5 to each side, quantity of times).

*Statistical analysis:* the obtained data were processed with the help of SPSS 17.0 program. We calculated mean arithmetic ( $\bar{x}$ ); mean square deviation (s); variation coefficient (V), correlation coefficient (r). The level of significance was taken as  $p \leq 0.05$ .

## Results

Control of any movement means control over its space, time and dynamic parameters. But effective control of motor parameters is impossible without information about these parameters. Determination of such information and its significance for motor control in junior volleyball players' motor training is the sense of our research. We found how information was perceived by mind in order to facilitate formation of conscious motor control. Correlation analysis methods permitted to show dependence of volleyball techniques' effectiveness on different psycho-motor abilities' indicators. In our research we analyzed junior sportsmen's abilities to control space-time and dynamic motor parameters (see table 1). The trainees coped better with reproduction of motor parameters than with assessment and differentiation. Error of muscular effort reproduction was 10%. Reproduction of effort of 0.5 from maximal from maximal and minimal increase of effort resulted in more noticeable mistake – 20%. It is evident that information about muscular efforts from receptors is comprehended poorly. Ligament receptors are the main sources of information (Farfel', 2011). Additional information can also be supplied by skin receptors. The role of other receptors in this case is negligible. Restricted character of informational sources about muscular effort is the main reason of their conscious control difficulties.

Analysis of disciples' ability to control motor space parameters showed higher accuracy, comparing with control of muscular efforts. Error of joint angle reproduction was 5%. Error of measuring amplitude of 0.5 from reference movement in shoulder joint was 8%. The reasons of high movements' accuracy without visual control can be found in specificities of joint receptors, signal from which easily reach mind (Bernshtejn, 1996). Thus, control over motor space parameters is fully conscious. At the same time simultaneous control of muscular effort is realized at lower levels of nervous system. Study of disciples' ability to control motor time parameters showed high accuracy of this task's fulfillment. Error of 5 seconds' interval reproduction was 6%. Error in test for disciples' ability to differentiate motor time parameters was 8%.

Level of formation of ball pass by two arms from above and from below was higher than of service. It can be explained by this element's higher coordination complexity, as far as in service technique movements are asynchronous. One arm makes movement with one rhythm, the other – in different.

**Table 1.** Indicators of psycho-motor abilities and technical fitness of junior (10-11 years' age) volleyball players

Indicators	Indicators' values		
	$\bar{x}$	S	V (%)
Accuracy of muscular efforts' reproduction, kg	1.52	0.58	37.9
Accuracy of assessment and measuring muscular effort's value, kg	2.9	1.12	38.6
Power differential threshold, kg	1.8	0.58	32.2
Accuracy of movements' reproduction (40–80°)	4.91	2.28	45
Accuracy of assessment and measuring of motor space parameters	8	3.5	43.8
Accuracy of amplitudes' differentiation	5.7	2.23	38.6
Accuracy of time intervals' reproduction (5 sec)	0.3	0.18	58
Accuracy of assessment and measuring of time intervals (sec)	0.34	0.1	29.4
Accuracy of time intervals' differentiation (sec)	0.4	0.21	52.5
Integral indicator of kinesthetic differentiations (quantity of points)	7	3.6	51.4
Indicator of motor memory (quantity of times)	1.87	0.74	39.4
Ball pass by two arms from above (quantity of times)	11.3	3.7	32
Ball pass by two arms from below (quantity of times)	16.1	8	49.7
Low direct service (quantity of times)	7.1	1.35	18.3

Notes:  $\bar{x}$  – mean arithmetic; s – mean square deviation; V – variation coefficient.

The next task of the research was to find interconnection between of successfulness of junior sportsmen's mastering volleyball techniques and their psycho-motor abilities. From total complex of psycho-motor abilities we chose abilities for reproduction, assessment and differentiation space-time and dynamic motor parameters. Besides, we used indicator of motor memory. Just these indicators are important for successful mastering motor actions (Bernshtejn, 1996; Krucovich, & Vorob'ev, 2005). High correlation was found between indicator of ball pass by two arms from above and reproduction of muscular efforts ( $r=0.76$ ,  $p<0.05$ ). It proves again high significance of muscular feeling for successful fulfillment of volleyball techniques. Average correlation was found between ball pass by two arms from above and complex manifestation of kinesthetic senses ( $r=0.59$ ,  $p<0.05$ ). It can be explained by holistic interaction of motor coordination's indicators in volleyball player's motor functioning. At low level was correlation of this technique and motor memory ( $r=0.41$ ,

p<0.05). It is connected with already formed dynamic stereotype of technique in junior volleyball players: control of motor action is realized with the help of signals from pro-prioreceptors and vestibular analyzer. The role of other memory processes is negligible.

Indicator of ball pass from below by two arms correlated at low level with indicators of time intervals' reproduction ( $r=0.33$ ,  $p<0.05$ ) and differentiation of muscular efforts ( $r=0.47$ ,  $p<0.05$ ). We found average correlation level between fulfillment of this technique and time intervals' differentiation ( $r=0.62$ ,  $p<0.05$ ). This technique is also in average correlation with space-time motor parameters' differentiation (from  $r=0.47$  to  $r=0.59$ ,  $p<0.05$ ). We also found the absence of most of confident correlations between ability for reproduction, assessment and differentiation of space-time and dynamic motor parameters. These abilities are differentiated and controlled by pro-prioreceptors. Exclusion were correlations between reproduction of motor space parameters and time intervals' differentiation ( $r=0.41$ ,  $p<0.05$ ). Average correlation between amplitudes' differentiation and muscular efforts' assessment was determined ( $r=0.66$ ,  $p<0.05$ ), as well as assessment of time and dynamic motor parameters ( $r=0.71$ ,  $p<0.05$ ).

## Discussion

Volleyball requires fine regulation of movements' quickness, which influences on distance of ball's flight. In most cases ball shall be thrown at definite distance according to game situation. So space accuracy of movements, on which accuracy of ball depends, is of special importance (Raiola, 2012; Doroshenko, 2013; Stankiewicz, 2013). One of the most frequent tasks in volleyball is determination of ball's trajectory and speed. Ability to solve such tasks can be trained by creation of conditions for improvement of motor control systems (Zhelezniak, Portnov, & Savin, 2001; Marques et al., 2010). Volleyball players' motor functioning is characterized by extreme variety and complexity. All complex movements are fulfilled in conditions of time deficit and with high accuracy. Difficulty of fulfillment is conditioned also by great physical and nervous-emotional tension. It is not occasional that specialists in children's sports note demand in application of additional means and methods for development of children's psycho-motor functions. Natural growth of functional development can not ensure fulfillment of requirements, which sports set to youth (Beliaev, 2005; Croitoru, Grigore, Badea, & Hantau, 2013; Karatnyk, Hrechaniuk, & Pityn, 2015).

High coordination complexity of main volleyball techniques requires from sportsman significant abilities for controlling space-time and dynamic motor parameters. As per the data of Farfel' V. S. (Farfel', 2011) children's ability to control own movements improves confidently in age from 8 to 12-13 years. From physiological point of view it is explained by completion of motor analyzer's formation.

Study of junior sportsmen's ability to control main motor parameters is of great importance for motor training. Disciples with better indicators of movement amplitude's, time intervals' and muscular efforts' reproduction more successfully master sport exercises (Farfel', 2011). In our research we found high variability of these indicators. It witnesses that junior sportsmen's psycho-motor abilities manifest individually. That is why it would be purposeful to use differentiated approach to their improvement. Other authors (Markov, & Nikolaeva, 2013) recommend training motor actions, considering individual features of development of main motor coordination parameters. In preparatory part of training it is recommended to fulfill motor tasks for development of weaker indicators. After their strengthening it would be useful to offer to these children complexes of special tasks, mainly in game forms. Special training tasks shall take 15-20 minutes. It is necessary to include in every training from 4 to 6 special exercises with repetition of each from 4 to 6 times. Results of our research prove correctness of such approach to motor training.

Results of our research proved significance of abilities for controlling space-time and dynamic motor parameters. They influence on success in mastering volleyball techniques. We found absence of high correlations between these indicators and technical skillfulness of junior volleyball players. In motor activity such abilities manifest in natural interaction, but not separately. We found the presence of high quantity of the so called simple abilities (abilities for reproduction, assessment and differentiation of space-time and dynamic parameters) (Bernshtejn, 1996). It can be explained by the fact that control of movements by different parameters is realized by different pro-prioreceptors. In this connection, for their development it would be good to use motor tasks of two variants. First variant implies selective tasks for accuracy of reproduction, assessment and differentiation of any one motor parameter (space, time or dynamic). The second variant means tasks for accuracy of motor actions in the whole. In modern sports there is a demand in correct junior sportsmen's training to technical elements already at initial stages. In order to avoid re-training at next stages, it is necessary to pay special attention to programmed training and objective means of current information (Lobietti, Coleman, Pizzichillo, & Merni, 2010; Zaporozhanov, Kochanowicz, & Kochanowicz, 2014; Arziutov, Iermakov, Bartik, Nosko, & Cynarski, 2016). Effectiveness of technical training depends on sportsman's ability to analyze muscular feelings. However, basing on own senses, athletes often make mistakes in assessment of kinematic and dynamic motor parameters. That is why sportsmen require additional information from their coach. But visual observation of coach can not give exact assessment of kinematic motor parameters (Iermakov, 2001; Bykov, 2012; Bizin, & Mirgorod, 2015). In the process of formation of junior volleyball players' ability to control motor kinematic and dynamic parameters it would be useful to apply leading up and preparatory exercises as well as simulators, preparatory games and developing training with the help of training theory principles (Zhelezniak,

1988; Pashkova, 2009). Because just at initial stage influence of volleyball means (technical exercises, tactic and two-parties' game) on physical condition and organism's functional state does not give desired results. Through this reason preparatory exercises are regarded by scientists (Markov, & Nikolaeva, 2013) as effective mean of purposeful quickness development. Such exercises facilitate improvement space orientation, strength and muscles contraction quickness. Leading up exercises help to correctly master movement's structure and form. Such exercises also form junior volleyball players' correct idea about speed-power components, characteristic for technique. Correctness of such approach to training is proved by results of our study.

### Conclusions

We can state that new ways of formation of junior volleyball players' technique, considering their individual features will facilitate training process effectiveness and children's sportsmanship.

Motor training is accompanied by changes in child's motor sphere and finishes with formation of skill in this action's fulfillment. It is an active process, implying involvement of thinking speech functions and memory, influence on them; influence on moral will qualities, emotions and motive of junior sportsmen.

Training is closely connected with thinking functioning for specifying of motor action's program and its imagining. For this purpose it is important to ensure high quality of verbal (manuals, descriptions), visual (demonstration, video, photos, pictures) and kinesthetic information (simulators and leading up exercises for training high accuracy of dynamic and space-time motor parameters).

Training of junior volleyball players should be practiced in close connection with development of main physical (speed, power, endurance, flexibility) and psycho-motor qualities (ability for reproduction, assessment, differentiation of space-time and dynamic motor parameters, motor memory).

Effectiveness of training process to large extent is determined by emotional relations between coach and junior sportsman. So, positive emotions are the basis of quick and reliable mastering of motor action.

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