

Reaction Force

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1. Introduction

Any person familiar with Taekwon-Do is aware that its techniques, when correctly performed, are able to create devastating results. Five factors contribute to the generation of these results. They are reaction force, concentration, equilibrium, breath control and speed. They may be considered basic principles of Taekwon-Do and all five must usually be present to optimise a technique. This essay focuses on the first of these principles, reaction force.

2. Reaction Force Generally

According to Isaac Newton's laws of physics, every force has an equal and opposite force (his third law). We call this opposite force the 'reaction force'. For example, if a car were to collide with a wall with the force of 1,000 kilograms then the wall would return a force of 1,000 kilograms; or if you were sparring an opponent who rushed at you at high speed and you executed a front-kick at his or her torso, the force with which your kick strikes would be that of your opponent's incoming force combined with that of your own outgoing, kicking force. The two forces combined are considerable and may achieve a devastating result against your opponent.

Reaction force may be explained another way. That is, any force initiated by body "A" and affecting body "B" will influence the former when it hits by producing a force that is equal but in the opposite direction (action = reaction). If your opponent directs a force, with either a foot or hand technique, against your body, an equally strong force is generated by your body, at the moment of impact, that is moving in an identical line but in the direction of your opponent (and to a lesser extent if your body is stationary).

3. Reaction Force and Equilibrium (Balance)

The five of the basic principles of taekwon-do mentioned in paragraph 1 work in harmony. An obvious example is reaction force and equilibrium. If we examine a left high inner-forearm block we see the left arm performs a circular inward / outward movement to the left. The right 'reaction' arm performs a circular inward / outward movement to the right. The left arm moves high (to eye level) and the right arm low (to hip level). The arms move simultaneously. The opposite and simultaneous movement created by utilising the reaction arm minimises any disproportionate shift in body weight during the execution of the blocking technique thereby maintaining overall balance and the control and focus of the technique. This is a type of balancing reaction force.

4. Your 'Internal' Reaction Force

'Continuing momentum' is another important element of the power of taekwon-do technique. It may be categorised under the basic principle of speed. To achieve maximum speed a person must again utilise reaction force. This may be done in the following manner:

1. creating a force with linear motion
2. creating a force with circular motion
3. creating a force with pendular motion.

A combination of 1, 2 and / or 3 may be utilised. For example, when executing a right fore-fist punch moving forward into a walking stance. The leg muscles generate linear force by pushing against the floor to create a forward motion. This creates momentum equally in all parts of the body. The hips are 'snapped' in a slight circular motion in the direction of the punch and the movement is further strengthened by the reaction force generated by the retraction of the non-punching arm. Sine-wave adds pendular motion. Muscular contraction (tension) just before impact adds velocity and the combined result is a powerful and damaging punch. Reaction force is involved at each step with a cumulative effect.

5. Absorbing Reaction Force to Create Power

One way to generate power in your taekwon-do technique, particularly striking, is to utilise your 'power base'. Creating muscular strength by anchoring your legs / feet to the ground enables you to take the counter shock resistance, or reaction force, of your strikes. Make your stance solid so that when you strike, your body will not be thrown out of position by the reaction force. If you strike while firmly rooted to the ground you should be able to maintain correct posture.

Otherwise, the reaction force generated when your strike impacts will cause your body position (equilibrium) or striking tool to give resulting in vulnerability and / or injury. Further, striking at the same instant as pressing the foot / feet against the ground will generate a reaction force passing through the body to the striking tool (hand, foot or otherwise), adding greater power to the strike (as discussed in paragraph 4).

6. Reaction Force and Stationary Targets

Many taekwon-do techniques are practiced by striking stationary targets such as boards or tiles. Because when an attacking tool strikes a stationary target, it will be subject to a force equal to that which it imparts, it is important that the strike be aimed (or directed) below the surface of the target. Strike 'through the target'. The continuing momentum (see paragraph 4) will nullify the reaction force of the target and should ultimately lead to its destruction. Two objects can not occupy the same space simultaneously so either you or the target (or both) have to give. Ensure that at the moment of impact the body is in a strong and stable position to prevent the loss of balance and / or power or an injury resulting from the returned reaction force.

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