

The Power of Compromise

By Michael Booth

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Introduction

This may seem like an odd title given that Karate is commonly perceived to be about the pursuit of perfection, be it the perfect technique or the perfection of ourselves, but in reality everything we do is some sort of compromise. This should not be unexpected; any activity where there are a number of factors involved requires the correct balance between them. So are we in fact not searching for perfection itself, but instead the perfect compromise?

It is my intention within this article to demonstrate some of the factors involved in the generation of power and how by considering these factors we can make the best compromise to suit ourselves. We all have different physical and mental attributes. I feel it is very important that after reading this article you, the reader, appreciate that precisely because of this there isn't a one size fits all solution; but that by acknowledging this you can apply the principles to play to your strengths and manage your weaknesses to find the best solution for you.

This article is really just an introduction into the subject. It will be followed in time by others expanding and analysing the points made here. It has been said Karate is like an onion, for each layer you remove another is always beneath. Throughout this document, and those to follow I will give examples, please appreciate that for clarity and to aid understanding I have made the examples as simple as possible. They do not fully describe any of the subtleties of the techniques. Instead, here I want to get across the gross issues – the outermost layer, the big picture stuff, please bear this in mind.

In my view the way to deliver a functional, powerful strike is to obtain the best combination of the delivery system, the reaction system, and competence. The delivery system is a catch all term for the way in which we transfer energy out. Conversely, the reaction system is the way in which we cope with the resultant force which on each and every impact transfers energy back, as a shockwave, into us. Competence relates to the intrinsic skills such as awareness and timing which put you in the right place at the right time.

The key word here is functional, because if it isn't then you are just a wasting time and effort: this is an important concept to understand, in real life it is not just about how much absolute power that you can generate. The intent of Karate is and remains to be survival, getting home in one piece. We train with the intent of "one strike one kill" but that isn't real life. Instead in real life we need other competencies to develop the opportunity to deliver an effective strike and the control to make sure it is sufficient to do the job. This isn't ancient Japan, there are limits to what we can do legally; we must not cause excessive damage as defined by the rules of engagement in modern society. In fact, is this not a compromise too? The decision to not hit as hard as you possibly can is a compromise between your personal/family safety and your desire not to go to jail.

So with this compromise in mind we now we know it is not strictly speaking how much power we generate that matters, but what we do with it; do you know what you are doing with yours? Your power can be deadlocked inside of yourself, or can bounce back into yourself as a resultant force, or be placed onto your opponent's surface, into your opponent's core, or through and out the other side of your opponent. This directly affects the outcome of the strike, for example if you somehow generate 10 bits of power, and through poor application of technique 9 bits actually just bounce back or even pass through

your opponent, how is that different to making just 1 and putting it properly, carefully and with intent where it needs to be i.e. inside your opponent? Visually it may be different I suppose, if you make your opponent fly backwards, and I would concede that this may sometimes be of benefit; but in reality it is the same in terms of damage done which is the true measure of power.

So now we know the principles of power generation must be considered alongside the concept of functionality, which includes deliberate placement of the power and therefore its effectiveness.

It seems to me that it is far better to be technically accurate than to be gung-ho. I would rather apply less power well than more poorly, because as demonstrated above the net effect is likely to be more, and it certainly will be when you become fatigued or older and reliance on physical strength becomes a major disadvantage.

This is but one example of what I mean by competence. I could have the potential to punch through walls, but if I can't use it because, for example I stand too far away what use is that to me? Absolutely none, so concentrating on just being able to hit hard is of less value than learning how to block, how to move, use perception and deception, in short how to be competent. That said if you do manage to create an opportunity you will need to be able to exploit it, so let's explore the physics of striking.

A scientific approach to power generation

I am by profession a Mechanical Engineer, trained in how to analyse situations in a mathematical way. I will be using these skills in order to demonstrate the various concepts under discussion starting with the fundamentals of power generation. If the following appears a little too mathematical then please just concentrate on the proposed relationships, the numbers are just there to help demonstrate how the various factors are related.

A number of people have tried to describe power mathematically as...

Force = Mass x Acceleration

This is in fact incorrect. Force is not Power. Think of it this way – if a car (1000kg) is travelling at a constant speed, let's say 70 mph, then it is not accelerating (i.e. $A = 0$) so...

Force = $1000 \times 0 = 0$

...but we all know if the car was to collide with you then you would still be dead. Why? Well because it is moving, and therefore it has Inertia (Mass x Velocity), not Power. The definition of Power according to any Engineering text book is "the rate of work being done". Which suggests that is not just how much effort you are putting in that is important, but how short the time period is in which it is effort is exerted. Given that time is directly related to acceleration, which in turn controls the velocity. In mathematical terms the correct equation is...

Power = Acceleration x Mass x Velocity (where acceleration x mass = force and mass x velocity = inertia).

Power is in fact a combination of Force and Inertia. The equation describes the amount of energy in the form of power present. So, logically if we hit with all of our mass (which is dependent on technique), while travelling as fast as possible and accelerating as much as possible (dependant on dynamism) at the point of impact (dependant on timing) then the result is a maximum power (maximum energy) strike. Sound easy? If only!

Discussion

There are some things which we know without thought, bigger people tend to hit harder, and small people are faster, the sun comes up in the morning etc. We know this because we have seen the evidence of it with our own eyes as we have grown up, and been told it by our peers and the media, so we accept it as true but never consider why?

So let's ask why. If we use the power equation we can compare how a heavy and a light man can generate power. The numbers are of no scientific value – merely representative. I am however (as discussed in paragraph 3) using extreme values of a particularly slow large man and a particularly fast light man to prove a point, and in both cases I am assuming that all of the person's weight is in use, which means I am disregarding technique. In other words I am taking the ideal case.

Criteria	Heavy man	Light man
Weight	100 Kg (Approx 16 stone)	60 Kg (Approx 9½ stone)
Velocity in direction of strike at impact	1 m/s	3 m/s
Acceleration in direction of strike at impact	0 m/s	1 m/s

The Heavy man: - Power = Acceleration x Mass x Velocity. $P = MVA = 100 \times 1 \times 0 = 0$, but Inertia = 100 Kgm/s

The Light man: - $P = MVA = 60 \times 3 \times 1 = 180$ Watts

Rather unexpectedly perhaps, the large man is actually generating no power at all. Regardless of how fast his strike is or how heavy he is, if he is not accelerating at the point of impact then he has no power, merely energy in the form of inertia, as in the example of the car earlier. However, as in the case of the car the strike may still be very effective and damaging to the opponent.

In terms of power generation we believe that the heavy mans greatest asset is his weight. But poor technique could lead to the majority of this weight not being in use during the strike, which combined with slower movements can result in relatively low or no power or inertia generation. In practical terms, slow movements can often be seen and therefore controlled/avoided altogether.

It is my belief that the greatest asset of the heavy man is not his weight (delivery system), but his ability to resist the resultant force (reaction system). His general size and strength can mask his structural imperfections. Whilst the lighter man must have all the appropriate angles of his structure absolutely correct otherwise he will buckle under the resultant force (the chain being only as strong as its weakest link) the heavy man doesn't.

This is in my opinion the real reason why we know, because it is normally true, that heavier men hit harder is because they have an in built tolerance for imperfection. They can be less accurate structurally and still cope with the resultant force. Given that the average man on the street has no training, and is therefore structurally poor, this inbuilt tolerance is a real advantage.

In the example above we see that the lighter man is generating power. As a consequence of his speed and acceleration, he has magnified his weight to produce power, but the inertia component is less than the heavier man. For the light man we believe his speed is his

greatest asset. But by if, due to poor technique, we have the majority of his mass not being used during the strike then all this speed is multiplying a low value, which can result in very low power generation.

In practical terms, a downside for the light man of being so quick is that we can have the condition where the strike has reached maximum speed before impact, and therefore has zero or even negative acceleration resulting in no power, merely energy in the form of inertia, which given his low weight is likely to be quite small. Also, such rapid movements often lead to the deliverer feeling rushed, which in turn leads not being grounded, so the strikes often bounce off due to not coping sufficiently with the resultant force. So we have seen the light man can be powerful, but to do so he needs to be much better technically than a heavier man to achieve the same result.

Whichever compromise you choose, you must be competent enough to apply it properly. This is where the value of experience shows. For example I have seen, as I expect you have too, people trying to hit pads at full power who are trying so hard that their structure becomes misshapen, the back becomes bent/twisted/stooped, the shoulder pushed through too far and the stances incorrect (the key word here is structure). We know it is wrong, we certainly wouldn't accept it whilst doing basics in the ESKK – so why do we do it during the “practical applications”?

Can I suggest you don't, I know that mentally it feels harder but the simple fact is it is not. This is in my limited experience often due to over-reaching. In fact I believe this is an example of how you all subconsciously apply the principle of maai (fighting distance). Basically we don't want to be hit, so we try to operate just beyond our opponents reach because we feel safer. This is a sound general philosophy - until you try to strike from there. If you punch correctly from this range you will miss, or at best barely contact the target area. If they can't hit you then how can you hit them properly from the same range? I think we can become so used to this range that we even do it when hitting the pads, and realising that we will barely reach we lean forward and break form, so in many cases this structural imperfection can be remedied by just moving a mere 6" closer to your pads/opponent whenever you intend to strike. This shows the value of competence, and that regardless of your potential it can be wasted by a simple lack of awareness.

A further consideration is the mental aspect. I believe our own body image (how we view ourselves) plays a significant part in our abilities. I recently performed an experiment and you can do this too. As a friend to do the following; to stand with eyes closed and arms hanging limp, while imagining themselves holding a bucket in each hand. Then ask them to imagine you are filling the buckets with water. As the imaginary load increases their stance will change, becoming more grounded, the angles of the hips will align to the imagined load. If you now suggest that one bucket is becoming heavier than the other they will move their hips to align with this imagined change.

Why? - Your mind controls your body. If you believe something to be true, then to you it is, and the body will adjust its self to suit. In this experiment (when the buckets weighed the same) the stance of the light men changed, becoming more grounded through realigning the knees and hips, but the stance of the heavy/strong man didn't change. Why? Well I believe it is because according to his mental image of himself the weight of two buckets is a trivial thing, easily coped with without needing to realign his structure.

When asked to imagine that one bucket weighed more than the other both the light and heavy men moved the hips and shoulders to realign themselves. I believe it is because subconsciously they all know that putting a weight in one hand moves the centre of gravity towards the heaviest bucket, and to cope with this change they need to realign the hips to

become balanced, and this is true regardless of strength. This also, confirms that the heavy/strong man was performing the experiment correctly.

The proof of this is that I can confirm each man is right handed, simply from this experiment. I correctly guessed in each case that they imagined the weight in the right hand. I didn't tell them which hand was heavier but they each know which hand is easier for them and without thought, they automatically picked up the heavy weight with their strong side.

The next step in this experiment is to stand square on to a pad where contact would be at about 70% extension of your arm, with the pad at approximately your sternum height. You must imagine your hand is heavy, perhaps even holding a bucket again throughout this experiment. Then without effort; by which I mean relax, don't try to hit hard using muscular contraction; pull your hand up and out through a circular motion, to punch the pad. It will feel harder than normal.

The mind is a powerful tool, and your 'self image' strongly affects your subconscious actions. Relating this back to power, I have found if you feel weak or slow, or that you will bounce off then you will. Not because it is actually true, but because you believe it to be true. So be positive and relax, if you imagine your hands are heavy they will tend to be – this is important.

The reality is that the three main factors (delivery system, reaction system and competence) are so fundamental they are heavily dependent on each other, change one and you affect the others. So in order to visually demonstrate the inter-relationships involved in delivering a functional strike I have devised a mind map (see the end of the article). It is a way of representing the underpinning principles by asking "what has to be true for this to be true". It shows the main factors only. It is by no means complete, and yet it also shows just how complicated the inter-relationships are.

In order to read the diagram you must follow the arrows to identify the underpinning principles for each statement, for example one chain is Karate, Power: - Ability to generate maximum power, Delivery system, Inertia, Velocity, and Technique. So the Mind map shows that ONE the root principle of Karate is Technique – sound familiar?

I devised the Mind map with an open mind, and yet it reinforces the core beliefs within the E.S.K.K, with respect to what we emphasize and how we train. If you look at the Mind map you will see 3 "nodes" which have a large number of arrows pointing towards them. Logically they represent the more important principles. Following this logic the most important principle is technique (5 arrows). It is important to ensure that our techniques are technically superior to make the most efficient/effective use of your efforts. Physical fitness (5 arrows) relates directly to your strength, stamina, speed, and acceleration. You must have sufficient capability in each to be effective. Timing (4 arrows) relates to competence, and awareness. Unsurprisingly everything is interrelated, poor timing will lead to poorer techniques and increase the burden on your fitness, which means less energy will be available for the next technique.

Conclusions

Whenever, as we very often do, talk about hitting hard we always, without exception, talk about power. I hope that by reading this document so far you will now appreciate that it is not power but energy. Whether your strikes are genuinely powerful (in the correct interpretation of the term) or are instead just inertia, the amount of damage done will be dependant solely on the amount of energy you manage to transfer into your opponent. I

have known many people who “Inertia strike”, and quite frankly, powerful or not I would much rather not be on the receiving end, no thank you – inertia strikes can be extremely concussive.

So the fundamental realisation is that for you to make the best compromise you must determine how for your own physiology you can obtain the highest value from multiplying your weight, velocity and acceleration. You will need to identify what changes in your technique, timing and physical fitness etc that are required to realise this change - to maximise your energy generation. This is a high level statement. In future articles I shall discuss specifics, to raise awareness of the available techniques.

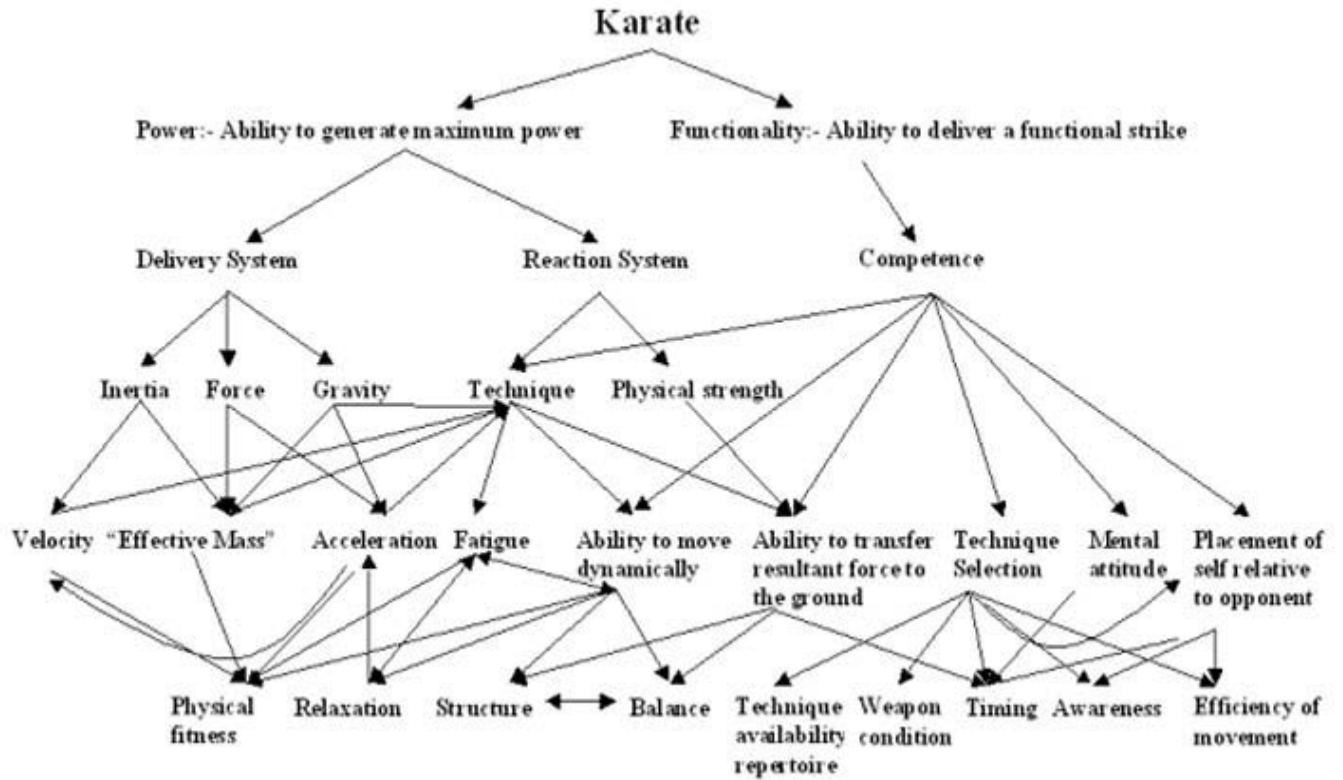
Irrespective of how much energy you can muster, it is of no use what-so-ever unless it can be transferred into your opponent and only the proportion which is in your opponent matters – the rest is waste. When you see people in the movies being hit and flying across the room this is a demonstration of poor technique. Done properly they should just drop, instead of wasting energy actually moving them, which just makes you more tired.

Regardless of how much energy involved or your ability to cope with the resultant force if you are not competent enough to use them effectively it is pointless. I believe that for all my interest in this subject it is of no value unless I concentrate on technical/awareness training even more.

Your mental attitude has a massive effect on your abilities. Project your mental strength and confidence. You must always believe in yourself; if you don't you are undermining your own foundations and will crumble from within.

It is, as I have already said, my hope that from this text you appreciate some of the fundamentals as I believe them. I suggest you consider the inter relationships detailed on the Mind map, and consider how you move and the effect this has on your energy so that you can determine your best compromise. But, as they say - the devil is in the detail. In the future articles I will describe in more detail each factor and relate them to the mind map. It is intended that these future articles can be read in any order subsequent to this document.

Good Luck!



(Mind Map)