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The Importance of Warm Up & Cool Down

Farah Fadzali, July 2020

Warm up and cool down are integral parts of preparation and recovery from any physical activity. Often times, these segments of training are overlooked and/or underutilised. Dancers are not able to fully prepare their bodies for dance training and retain the benefits of it. Therefore, we will discuss on how we can expand the advantages of these routine to achieve performance enhancement by understanding what it entails as well as its benefits when done properly.

The purpose of warming up

In tropical climates such as that experiences in Singapore, we are constantly exposed to higher temperatures with heightened levels of humidity. However, this is different from stimulating the internal physiological and neurological process necessary to safely prepare for dance activities¹⁴.

Take for example, “running” to rehearsal cannot be considered a proper warm up for dance training. Warm up is associated with positive effects on aerobic and anaerobic fitness parameters as well as flexibility, muscular strength, and power¹². It involves exercises that are likely to induce greater metabolic and cardiovascular changes in the body¹⁹.

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An effective warm up should involve static and dynamic stretching, and cardiovascular stimulation. Other key principles of warming up include *increasing the heart rate, mobilising the joints and lengthening of the muscle fibres.*

Increasing the Heart Rate

The first component of warm up involves increasing the heart rate from a non-active state to approximately 50 to 60 percent of dancer's personal heart rate maximum (HRmax)^{13,19} (refer to table 1 on how to calculate your heart rate). Increasing the heart rate allows an increase in oxygen-carrying capacity of the blood to the muscles. (Oxygen is transported by the blood to the muscles to produce energy for you to dance!)

Tips on calculating:

Age-predicted heart rate maximum (AHRmax):

$$\text{Age} - 220 \text{ beats per minute (bpm)} = \text{ ______ bpm}$$

Heart rate range that represents 50 to 60 percent of that AHRmax:

$$\text{ ______ bpm} \times 0.5 = \text{ ______ bpm}$$

$$\text{ ______ bpm} \times 0.6 = \text{ ______ bpm}$$

For example

A 20-year-old dancer will have an AHRmax of:

$$20 - 220\text{bpm} = 200\text{bpm}$$

HR range:

$$200 \times 0.5 = 100\text{bpm}$$

$$200 \times 0.6 = 120\text{bpm}$$

This means that 100 to 120 bpm is the range of heart intensity during warm-up for a 20-year-old.

Table 1. Heart rate equation

Mobilising the Joints

Mobilising the joints during a warm up is particularly important due to the extreme ranges of motion that dancers are required to perform. It also prepares the joints for safe loading (progressive intensity in a dance session)¹⁰. A successfully warmed up joint provides cushioning, distributing forces and impacts efficiently throughout the body.

Lengthening the Muscles

Despite the popularity of static stretches, research has shown that static stretching during warm up decreases strength and power capabilities¹⁶. In fact, the longer a static stretch is held, the greater the decrease in these abilities. Research also suggested that the most effective mode of stretching before an activity is dynamic stretching and brief static stretches^{2,16,17}. Dynamic stretching involves repeatedly moving the body part that will be used in the dance combinations following warm up by using gravity and momentum to assist. At the same time, it maintains control as the movement progressively builds towards an easy full range of motion (not forced).



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Benefits of Warming Up:

When done correctly, dancers can reap the benefits^{14,18} of:

- **Heightened neuromuscular transmissions resulting in increased reaction times and mental focus.** This gives you a better engagement and increased ability to pick up and execute movement sequences.
- **An increased metabolic process (metabolism) resulting in more efficient energy exchange,** which means that the body will be able to produce energy efficiently.
- **Increase joint lubrication as joints are primed with their innate shock-absorption capacity,** which results in a decreased rate of associated injury.

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- **An increase heart rate will allow for better oxygen exchange and delivery throughout the body with an increase in blood vessel's diameter.** This enables the body and muscles to perform more efficiently, at the same time preventing any muscle strain.
- **Increase in proprioceptive neuromuscular coordination** enhances mobility and stability.

So how can we design a warm up that is effective for our students to gain these benefits?

The “RAMP” protocol

The “RAMP” protocol is a systematic approach to warming up while adopting the theories mentioned above. This protocol is scientifically proven to prepare dancers and athlete for upcoming performance and competition efficiently⁷. Table 2 and 3⁷ below further explain the RAMP protocol and its guidelines. A supplementary video with examples on how to warm up will also be posted next week on scape.sg dance science page, so keep a watch on the space.

(R)aise – Increase muscle temperature, core temperature, blood flow, muscle elasticity and neural activation

(A)ctivation – Engage the muscle in preparation for upcoming session

(M)obilise – Focus on movement patterns which will be used during the performance or competition

(P)otentiate – Gradually increasing the stress on the body in preparation for the upcoming session

Table 2. RAMP protocol

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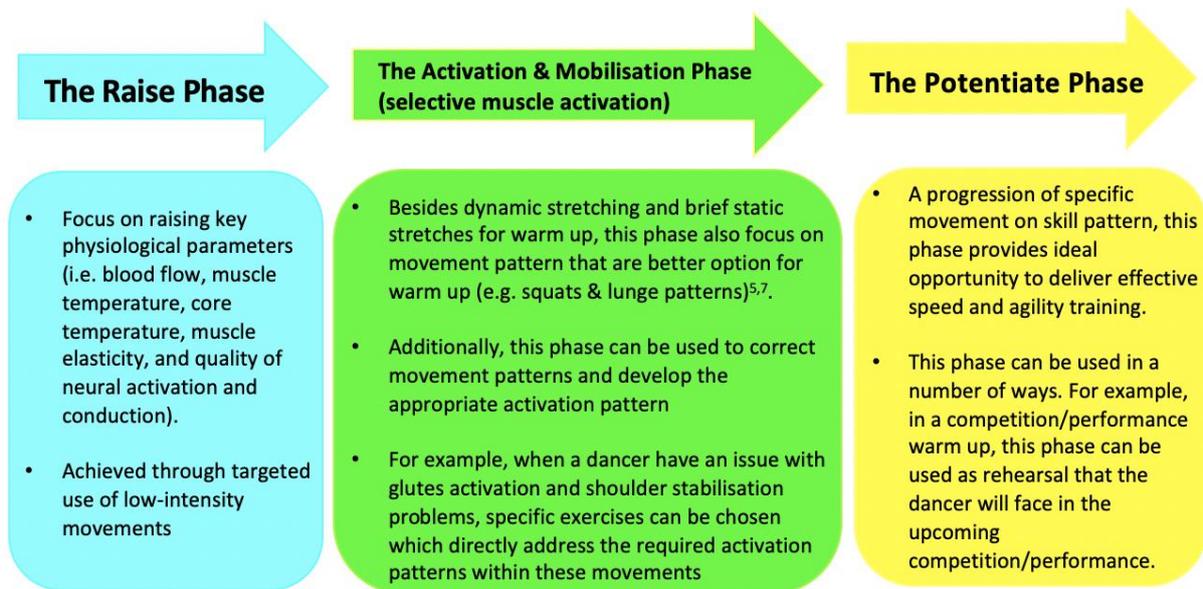


Table 3. RAMP protocol guideline⁷

What is a cool down and why should we perform it?

Studies has shown us that almost 60 – 80% percent of dancers do not perform any cool down exercises¹⁷. However, cool down exercises is essential for rapid regeneration of the body and mind, speeding up the elimination of metabolic waste products produced from bodily exertions when dancing.

The purpose of cooling down

Imagine slamming onto the car brakes when the car is going at full speed- that is what it is like to suddenly cease activity when the heart rate, metabolism and nervous systems are at a heightened state of activity. If we do not do that to our cars, we should not do that to our bodies. An effective cool down reduces injuries and the effects of delayed onset muscle soreness (DOMS), also known as the muscle ache you get two days after training¹⁷. As such, when designing a cool down, one must consider the type, level of intensity and duration of training prior to the cool down. The key principles of cooling down includes *reducing the heart rate*, *easing out the joints* and *releasing muscular tension*.



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Reducing the Heart Rate

When transiting from a strenuous activity to a more neutral state, the heart rate gradually returns to its normal level, redistributing the blood back to the vital organs, supporting gradual elimination of by-product such as excessive build-up of lactic acid (the soreness you get the next two days - DOMS)^{6,18,20}.

Easing Out the Joints

Returning to gentle joint mobilisation with the intention of rebalancing the soft-tissue activation and redistributing the synovial fluid (found in between your joints to help lubricate to reduce friction) balance supports long-term health of the joint capsule and aid preparation for stretching^{14,17}. Gentle mobilisation of the joints through their comfortable range of motion with limited tension and force is ideal.

Releasing Muscular Tension

The main intention of this is to release built-up muscular tension and lengthening the muscle fibres to their resting length. Static stretching and proprioceptive neuromuscular facilitation (PNF) are both appropriate for this cooling down phase with safety measures taken into consideration^{3,18}. Breathing is also essential in order to increase the space and range of motion of the relevant joint (easing the joint-going deeper into the stretch)¹⁴.

Benefits of Cooling Down:

Here are the benefits of cool down^{2,10,12}:

- **Restored cardiorespiratory, neuromuscular and metabolic functioning** - reduces the likelihood of dizziness This is especially important as more red blood cells from the brain flows to the muscles during class. By performing the cool down, it will allow for redistribution of the blood back to the brain. As such, you will feel less dizzy after a dance session.
- **Reduced joint aches and muscle soreness**
- **Effective recovery to allow for safe return to subsequent activity** - decreased likelihood of injury. During a strenuous workout, the body goes through a number of stressful processes. The muscle fibres, tendons and ligaments are loose and waste products build up within the body. Hence, performing a proper cool down is essential in assisting the body with its repair process.
- **Reduction of mental stress or tension**

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Other considerations for dancers performing warm up and cool down in Singapore's context

Dancing in humid environment increases sweat production which means your body will have to work harder to cool off and prevent heat illnesses to occur^{2,14}. On top of that, sweat is less effective in humid environments as sweat drips off the body rather than evaporates, hence, more sweat has to be produced¹⁹. Dehydration eventually limits sweat production as the body tries to conserve fluid². (Quick tip: Isotonic drinks that contain carbohydrate and sodium will rehydrate more effectively than water while topping up body's limited carb store⁴) On the other hand, wearing warm-up gears will severely restrict evaporation and heat loss. As such, wearing sweat suits is discouraged⁸.



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Farah is now a dance science researcher studying injury prevention and performer's health and safety practices. Together with her achievements and qualifications, Farah hopes to work towards the development of dance science research in Singapore.

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