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Resistance Training, Recovery and Genetics: AMPD1 the Gene for Recovery

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Abstract

Genetics play a major role in every aspect of our lives; they determine our hair colour, eye colour, height, disease risks, gifts and some of our mannerisms. As such they also play a large function in our response to exercise and physical stressors. The gene AMPD1 is a protein coding gene, encoding adenosine monophosphate deminase 1. AMPD1 catalyses the deamination (the removal of an amine group from a molecule) of AMP to IMP in skeletal muscle, deficiency of the AMPD1 enzyme is a common cause of exercise-induced myopathy and probably the most common cause of metabolic myopathy. It appears that those with at least one T variant in AMPD1 (rs17602729) require longer rest periods between bouts of weight training, require longer between sessions and have increased perceived pain post training.

Keywords

Genetics; Resistance Training; Gene

Methods

This study was conducted during a period of DNA testing across the UK from 2014-2016 where 188 variants were tested amongst thousands of individuals, one of which was in the SNP rs17602729 which is a particular important SNP within AMPD1.

Certain variants within the SNP rs17602729 appear to have differing affects upon the AMPD1 enzyme [1]:

CC – Normal outcome: No deficiency in AMPD1 (common outcome in all current research) [1-4]

CT – Suboptimal outcome: deficiency in AMPD1 [4]

TT – Suboptimal outcome: Stop in gene, deficiency in AMPD1 [4]

Study

During the DNA collection process questions were answered by all the individuals, these had a wide range. For the purpose of the study we looked at:

Males: Age: 23-42.

Resistance training experience: 5-10 years.

Goal: To build or maintain muscle mass with an aim to compete in either bodybuilding or "physique" based events.

Range: 429 individuals.

The questions of interest for this study were:

1. How many times per week do you train?
2. Multiple choice answers. 1-2 days, 2-4 days, 4-6 days, 7 days per week.
3. How long do you spend in a typical resistance/weights session?
4. Multiple choice answers. 10-30 minutes, 30-45 minutes, 45-60 minutes, 60 minutes+
5. On a scale of 1-10, 1=no pain, 10=the worst pain, how do you feel 12-48 hours post training session?
6. How long on average do you take/rest between sets on average?

Multiple choice answers. 0-20s, 20-45s, 45-60s, 60-90s, 90-120s, 120s +.

The study looked at each individual's variant in rs17602729 and the answers they gave to the above questions; with the aim being that it may help us find out why we all train differently even if the goals are the same.

Results

Out of all 429 individuals the genetic outcomes were (Figure 1)

327 – Have rs17602729 CC variant

83 – Have rs17602729 CT variant

19 – Have rs17602729 TT variant

Results of the questions

CC Variant group

1. Question 1 - How many times per week do you train? 1-2 days (3), 2-4 days (72), 4-6 days (146), 7 days (111).

2. Question 2 - How long do you spend in a typical resistance/weights session? 10-30minutes (0), 30-45 minutes (97), 45-60 minutes (200), 60 minutes+ (30).

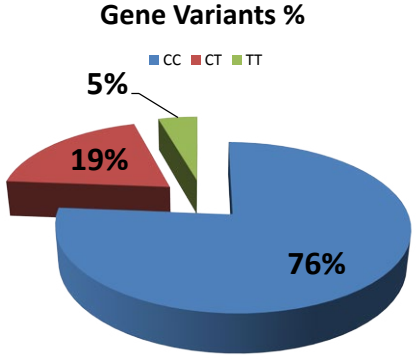

Figure 1: Genetic variants in terms of percentage.

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3. Question 3 - On a scale of 1-10, 1=no pain, 10=the worst pain, how do you feel 12-48 hours post training session? 2 - 187, 4 - 10, 5 - 29, 6 - 98, 9 - 3.

4. Question 4 - How long on average do you take/rest between sets on average? 0 -20s (0), 20-45s (296), 45-60s (31), 60-90s (0), 90-120s (0), 120s + (0).

CT Variant group

1. Question 1 - How many times per week do you train? 1-2 days (0), 2-4 days (79), 4-6 days (4), 7 days (0).

2. Question 2 - How long do you spend in a typical resistance/weights session? 10-30 minutes (0), 30-45 minutes (73), 45-60 minutes (10), 60 minutes+ (0).

3. Question 3 - On a scale of 1-10, 1=no pain, 10=the worst pain, how do you feel 12-48 hours post training session? 3-54, 7-19, 9-10.

4. Question 4 - How long on average do you take/rest between sets on average? 0 -20s (0), 20-45s (30), 45-60s (42), 60-90s (9), 90-120s (2), 120s + (0).

TT Variant group

1. Question 1 - How many times per week do you train? 1-2 days (3), 2-4 days (16), 4-6 days (0), 7 days (0).

2. Question 2 - How long do you spend in a typical resistance/weights session? 10-30minutes (1), 30-45 minutes (17), 45-60 minutes (1), 60 minutes+ (0).

3. Question 3 - On a scale of 1-10, 1=no pain, 10=the worst pain, how do you feel 12-48 hours post training session? 5-3, 8-12, 10-4.

4. Question 4 - How long on average do you take/rest between sets on average? 0 -20s (0), 20-45s (2), 45-60s (1), 60-90s (13), 90-120s (1), 120s + (2).

From the questionnaire although the common outcome of CC predominates numbers there are some stark difference in training patterns.

Most common outcomes

Q1.

CC Weekly training sessions – 4-6 days

CT Weekly training sessions – 2-4 days

TT Weekly training sessions – 2-4 days

Q2.

CC Length of session time – 45-60 minutes

CT Length of session time – 30-45 minutes

TT Length of session time – 30-45 minutes.

Q3.

CC Most common pain level felt post training – 2/10

CT Most common pain level felt post training – 3/10

TT Most common pain level felt post training – 8/10 (Figure 2)

Q4.

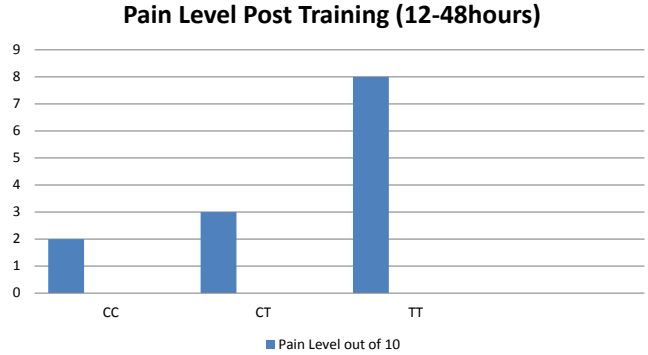

Figure 2: Pain level post training.

CC Average time recovering between sets – 20-45s

CT Average time recovering between sets – 45-60s

TT Average time recovering between sets – 60-90s

Conclusion

In conclusion the small study shows that along with all previous studies the CC variant appears to be the most common outcome. In regards to exercise it certainly appears that those carrying one T variant appear to recover from sessions slower and therefore train less, induce more pain or "perceive" more pain post training and take more time between sets. The participants analysed all had years of experience to come to the conclusion on what training works for them. None of the individuals analysed appeared to suffer outwardly in their aesthetic "look", even though some obviously trained less.

The study leads to two further questions:

Is it possible that being deficient in AMPD1 causes greater muscle adaptation and hypertrophy response, therefore making up for the lack of time spent in the gym? If so does this account for the perceived increase in pain?

If the participants knew their gene variants before ever starting training could all the guess work be taken out?

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