Exercise Plan Builder Background/Validation

Part One: Background

Historical Background:

Performance Lab produces the most sophisticated Training Plan Builder in the world.

The lead designer, Performance Lab founder and sports scientist, Jon Ackland, has been involved sports performance and health management for 30 years. New Zealand's geographical isolation, has uniquely led to Performance Lab's specialty in producing training and exercise programs that are used remotely which includes many strategies to maximise the success of unsupervised programs.

Jon has written 8 books (Ackland, 1994, 1998, 2000, 2006, 2007, 2008) on applying sports science to exercise and was one of first to write books on the practical implementation of periodization accessible to everyday people.
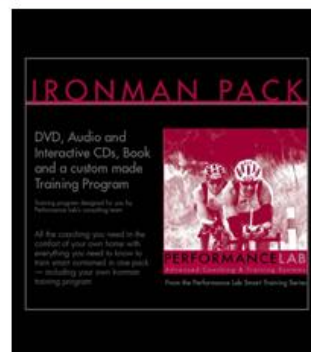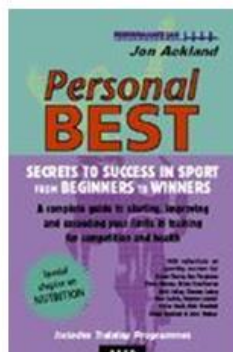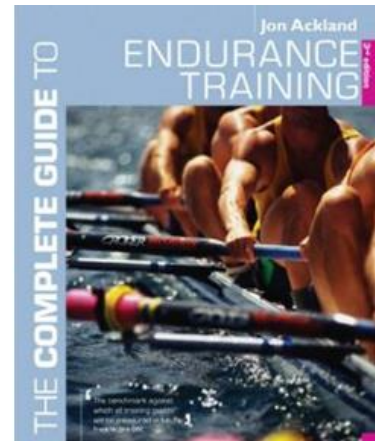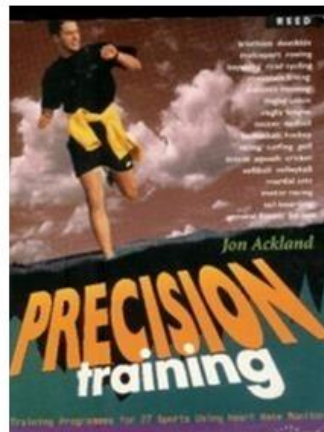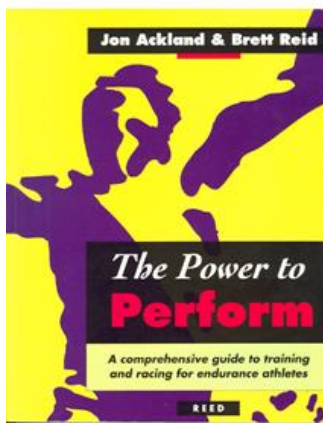

Figure 1. Some Titles of Performance Lab Books.

His books have received excellent reviews and his explanation of training methodologies have received numerous endorsements:

'The benchmark against which all training guides will be measured in the future'

> Frank W Dick - President European Athletic Association

'The best and most comprehensive all-round training guide I have read.'

'…have successfully made a general in-depth look at all facets of training that can only be of great assistance to both athletes and coaches'

Arthur Lydiard

One of the most influential founders of modern Endurance Training Principles, coached 4 Olympic Gold, 2 Bronze and 16 world records and influenced countless other performances with his 'Lydiard Principles' including Nike founder Bill Bowerman and was one of Jon's early mentors.

In his career, Jon has written more than 20,000 endurance training plans making him one of the most experienced authorities in the field. This has covered the range of experience from sedentary exercisers for health management to Olympic and World Championship athletes primarily in endurance sports.

Performance Lab (PL) was founded on the premise of giving *everyone* access to world leading training and exercise methodologies.

PL's programs use all the fundamental laws of periodization including the balance of training and recovery (Bompa, 1999), the adherence to specificity and the laws of progression (Joyce & Lewindon et al, 2014). (see Appendix: One of Performance Lab's Main Periodization Drivers for details.)

This emphasis on 'practical' has driven Jon's work ever since.

In his bestselling books 'Power to perform' (Ackland, 1994) and 'the Complete Guide to Endurance Training' (Ackland, 2007), Jon is still one of very few sports science writers to have laid out HOW to write a training program that a user can adapt to their personal needs and goals in a book.

Training Plan Systems:

In 2006, Performance Lab provided Exercise and Training Plan systems and advice to Adidas in the Asia-Pacific region which was very successful and won a number of national marketing awards.

Figure 2. Adidas adiRun Website with Early Performance Lab Training Program Selector.

Here is one the original programs for the system built for Adidas:

Figure 3. Original Adidas adiRun Training Program.

Endorsements from Adidas

"These programs were written by world-famous trainer and Ironman, Jon Ackland"
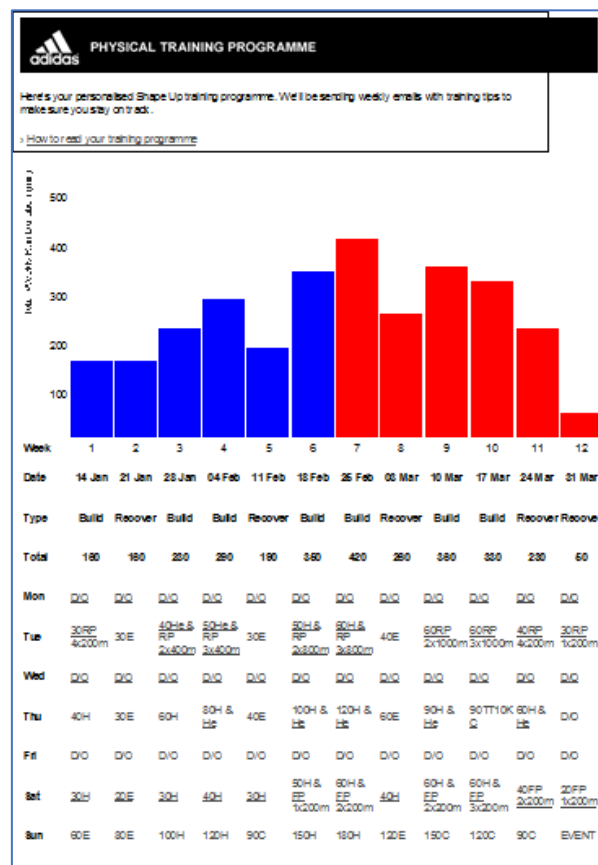
"When it comes to training athletes Jon is the definition of the word guru."

www.adirun.co.nz

Performance Lab also worked with digitalrowing.com, the worlds #1 indoor rowing software.

Figure 4. Digital Rowing Website with Rowpro Software Containing Performance Lab Training Programs.

Here is an example of a Rowpro Training Plan:

Fitness Plan for Dana Sculler

Dana's Fitness Plan
1 Sep, 2014 - 8 Dec, 2014

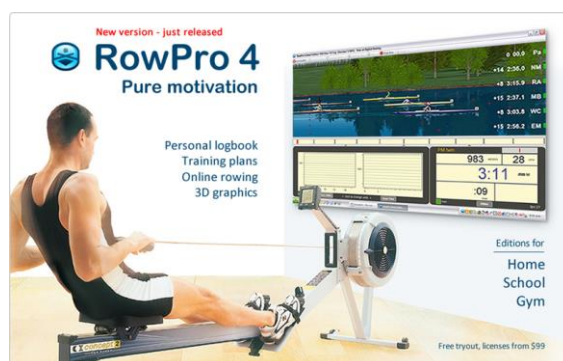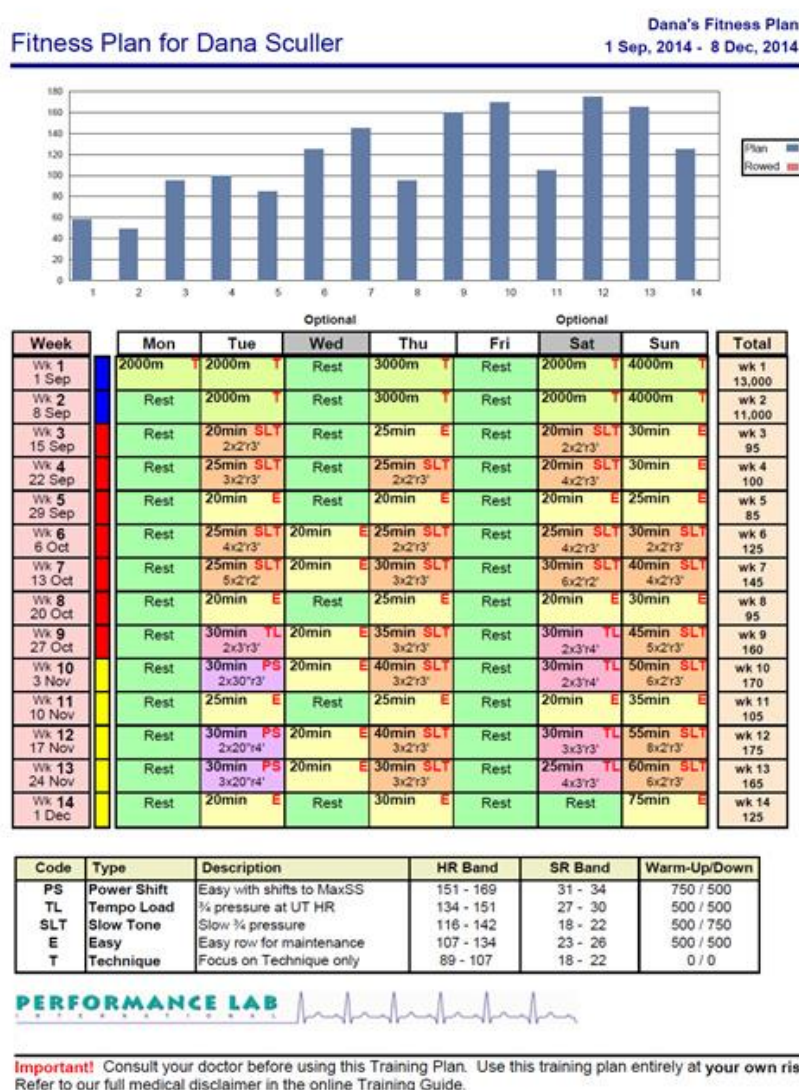| Week	Mon	Tue	Wed (Optional)	Thu	Fri	Sat (Optional)	Sun	Total
Wk 1 1 Sep	2000m T	2000m T	Rest	3000m T	Rest	2000m T	4000m T	wk 1 13,000
Wk 2 8 Sep	Rest	2000m T	Rest	3000m T	Rest	2000m T	4000m T	wk 2 11,000
Wk 3 15 Sep	Rest	20min SLT 2x2'r3'	Rest	25min E	Rest	20min SLT 2x2'r3'	30min E	wk 3 95
Wk 4 22 Sep	Rest	25min SLT 3x2'r3'	Rest	25min SLT 2x2'r3'	Rest	20min SLT 4x2'r3'	30min E	wk 4 100
Wk 5 29 Sep	Rest	20min E	Rest	20min E	Rest	20min E	25min E	wk 5 85
Wk 6 6 Oct	Rest	25min SLT 4x2'r3'	20min E	25min SLT 2x2'r3'	Rest	25min SLT 4x2'r3'	30min SLT 2x2'r3'	wk 6 125
Wk 7 13 Oct	Rest	25min SLT 5x2'r2'	20min E	30min SLT 3x2'r3'	Rest	30min SLT 6x2'r2'	40min SLT 4x2'r3'	wk 7 145
Wk 8 20 Oct	Rest	20min E	Rest	25min E	Rest	20min E	30min	wk 8 95
Wk 9 27 Oct	Rest	30min TL 2x3'r3'	20min E	35min SLT 3x3'r3'	Rest	30min TL 2x3'r4'	45min SLT 5x2'r3'	wk 9 160
Wk 10 3 Nov	Rest	30min PS 2x30"r3'	20min E	40min SLT 3x2'r3'	Rest	30min TL 2x3'r4'	50min SLT 6x2'r3'	wk 10 170
Wk 11 10 Nov	Rest	25min E	Rest	25min E	Rest	20min E	35min	wk 11 105
Wk 12 17 Nov	Rest	30min PS 2x20"r4'	20min E	40min SLT 3x2'r3'	Rest	30min TL 3x3'r3'	55min SLT 8x2'r3'	wk 12 175
Wk 13 24 Nov	Rest	30min PS 3x20"r4'	20min E	30min SLT 3x2'r3'	Rest	25min TL 4x3'r3'	60min SLT 6x2'r3'	wk 13 165
Wk 14 1 Dec	Rest	20min E	Rest	30min E	Rest	Rest	75min	wk 14 125

Code	Type	Description	HR Band	SR Band	Warm-Up/Down
PS	Power Shift	Easy with shifts to MaxSS	151 – 169	31 – 34	750 / 500
TL	Tempo Load	¾ pressure at UT HR	134 – 151	27 – 30	500 / 500
SLT	Slow Tone	Slow ¾ pressure	116 – 142	18 – 22	500 / 750
E	Easy	Easy row for maintenance	107 – 134	23 – 26	500 / 500
T	Technique	Focus on Technique only	89 – 107	18 – 22	0 / 0

PERFORMANCE LAB

Important! Consult your doctor before using this Training Plan. Use this training plan entirely at **your own risk**. Refer to our full medical disclaimer in the online Training Guide.

Figure 5. Original Training Program for Rowpro Software Used with Concept2 Rowing Ergometers.

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Endorsements from the Website:

"RowPro training plans are created by training guru Jon Ackland, one of the world's foremost experts in devising training plans for "remote training" situations where a training instructor is not present."

"All the training plans have been designed exclusively for RowPro by world-class training guru Jon Ackland."

Performance Lab has worked with a number of other companies in the Eyewear,

Figure 6. Oakley Radar Pace Containing Performance Lab Training Program and Coaching Algorithms.

Tracker and Hearable technologies.

Figure 7. Mio App Containing Performance Lab Training Program Algorithms.

Figure 8. Lifebeam VI Containing Performance Lab Coaching Algorithms.

Exercise Plan Success Rates

Corporate Trial (Sedentary to semi competitive participants)

To manually test the value of our training plans, PL conducted an in-house study for a large corporation involving 550 employees engaging in training for a Half Marathon. The participants were mainly sedentary. All the exercise was unsupervised.

We achieved an 89% completion rate for the training up to the event as opposed to the industry average of 10% and 100% completed the Half Marathon. The project continued for 5 years with as many as 1300 people training for each event in multiple countries.

A random sample from the study were physiologically post tested for a number of health factors. The average change in aerobic fitness (VO2max) was 22% (from 38.07 to 46.63ml/kg/min) while the average body weight dropped by 4.7% (84.18 to 80.2kg) and heart rate after 3mins of controlled exercise dropped by 11%. (100 to 89b/min)

In the post project survey, 86% said the overall experience was very good to excellent. 87% reported being more motivated after the event. 82% said they had higher energy levels through the training, 86% felt healthier, 90% felt fitter and 93% wanted to try something similar again. 92% believed the experience had a positive impact on your health and finally 62% were surprised with that they had achieved.

Mobile App and Training Plan Trial (recreational to semi competitive participants)

PL conducted another smaller trial, this time to investigate whether an unsupervised prototype ARDA app would support our methodology. The prototype was not optimised for compliance or UX.

Using the Training Programs gave consistently good gains (5-15%), implying 22% gains for sedentary users, 15% for moderately fit users and 5% for very fit users. Training without a program gave consistently bad gains (0-5%)

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Regarding 'churn', we had a 60% completion rate of the programs using the ARDA app unsupervised. This is a significantly higher than the compliance statistics in unsupervised scenarios, which are estimated to be no higher than 20%.

ARDA guided training programs resulted in a 300% higher completion rate than unsupervised programs.

86% believed ARDA had either a moderate or major impact on them completing their program and 72% said they would want to use an AI coaching product for future training, after using ARDA.

Beginner and recreational trial participants reported that they felt 'lonely' at the end of the trial without the ARDA app prototype.

Plan Validation

A small test was conducted to assess the effectiveness of the Performance Lab's Training Plans.

This is possible because Performance Lab have the only accurate non-invasive day to day cardio fitness testing system in the world where different workout frequencies, training mileages and hill climbing cumulative ascent data could be compared to changes in Cardio Performance.

We had a group of runners choose and follow a plan and we measured their Cardio Performance change based on key exercise plan criteria like the number of workouts per week, distance run per week and the amount of hill climbing in their running per week.

We found that the optimum number of workouts per week to improve fitness for most people is 3.
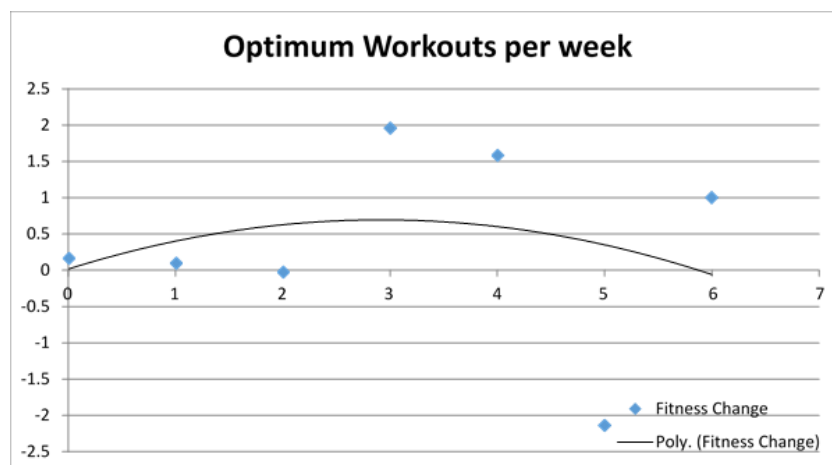

Figure 9. Graph of Fitness Change Versus Number of Workouts Run Per Week.

The optimum average distance for a program to improve fitness for most people was 25km. (15 miles). (Figure 12)

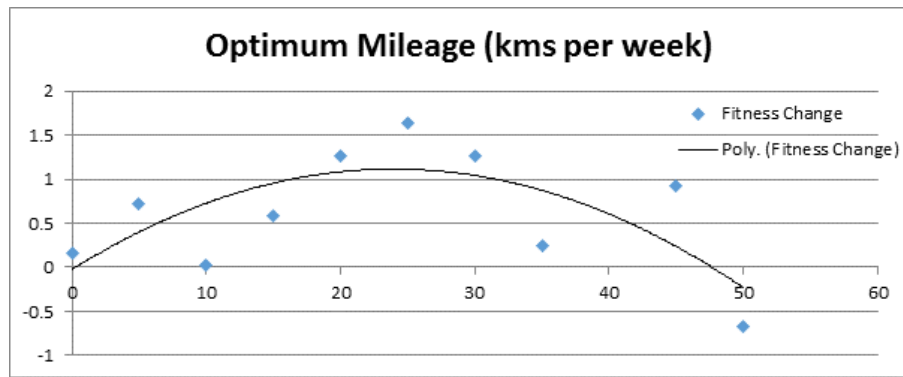Performance Lab Technologies © Updated August 2017

Figure 10. Graph of Fitness Change Versus Distance Run Per Week.

The optimum maximum number of vertical meters for a plan to improve fitness is approximately 350m (1148ft). (Figure 13)
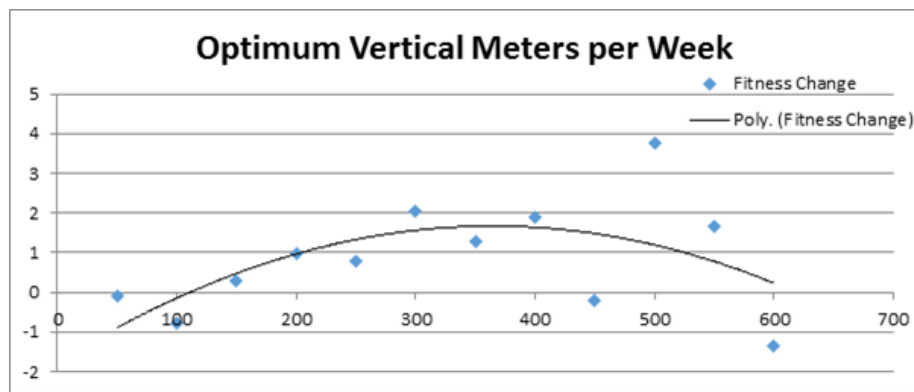

Figure 11. Graph of Fitness Change Versus Vertical Meters (Cumulative Hill Climbing Ascent) Run Per Week.

We couldn't test every training program because the Plan Builder actually writes every training plan (up to 270,000 of them) rather supplying pre-written templates. What we could do is test it versus the perceived 'average' runner as highlighted in our tests (Figures 9, 10 and 11).

We provided the plan builder with a profile of an 'average' goal orientated runner training for a Half Marathon (12 weeks), to see what the kind of program the Plan Builder would write. (Figure 12)

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Figure 12. Graph Showing the Selections Made by the Plan Builder for Workout Frequency, Maximum Vertical Meters and Average Training Volume per Week Which Matches the Validation Data.

The

- number of workouts per week (3),
- the average distance run (approx. 25kms) per week and
- the maximum vertical meters per week (approx. 350m)

all closely matched the plan designed by the Plan Builder. (Figure 12)

What Changes Performance the Most, Training Mileages or Hill Training?

We know speed training has an impact on performance change but what about all the other training in the program. What other types of Training are of most value and therefore improve the value of the training program in terms of maximising the user's fitness improvement.

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In Figure 13, the X axis is distance (in kilometres) run per week and the Y axis is vertical meters per week. The colours of the hexagons (darker meaning more improvement) and contour lines represent the average fitness change per week.

Placing vertical lines (13A) on the chart shows that an increase in vertical meters increases fitness. This is characterised by the colour of hexagons that move from lighter (less fitness change) to darker (more fitness change) on average from bottom to top.

Placing a horizontal line (13B. same vertical meters but more mileage) shows no real pattern of change (colour change horizontally). This means that distance has a less strong effect on fitness change.
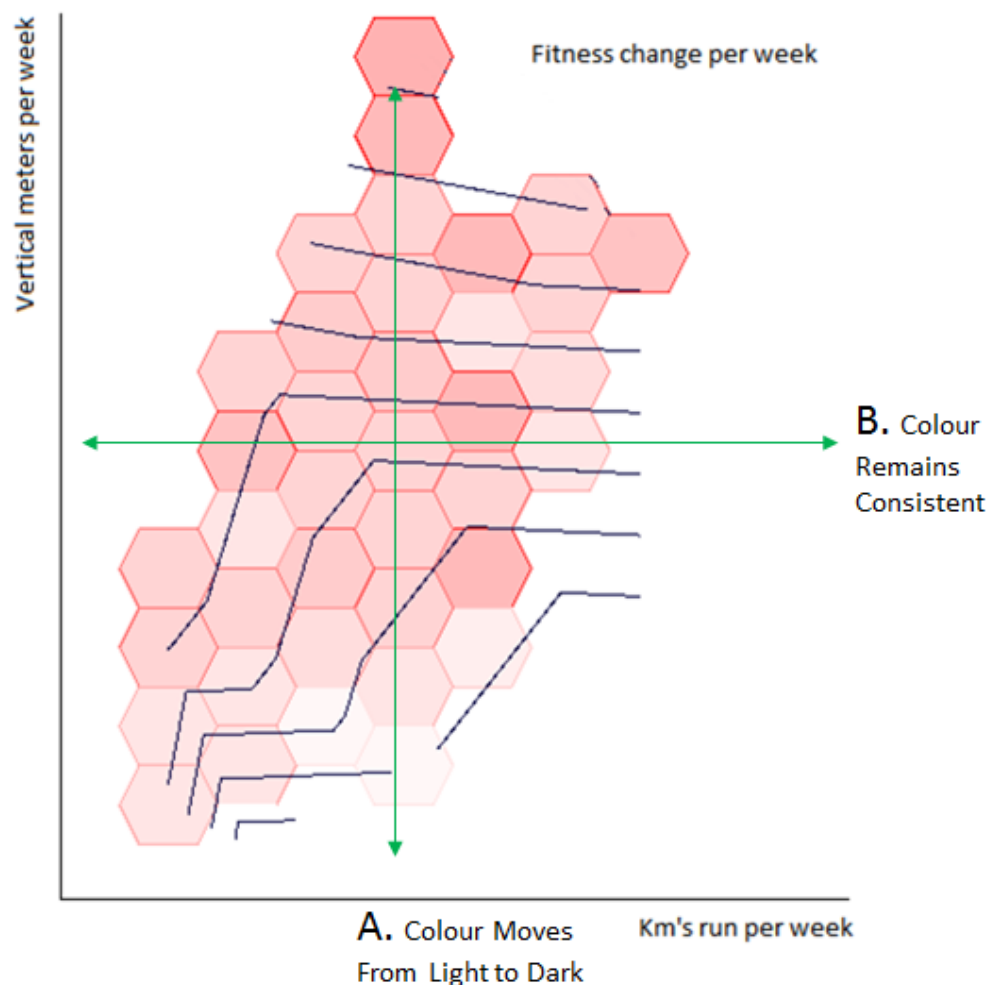

Figure 13. Graph Comparing Distance Training and Hill Training Value in Terms of Increasing Performance.

Performance Lab's Training Programs contain mileage, hill training (vertical meters) and speed work to maximise the fitness change in terms of time spent training.

See:

- A Machine That Can Write a Custom Training Program: Exercise Plan Builder Module
- Measuring Performance: Fitness and Fatigue Measures (Cardio Performance Module)

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