



An investigation into training load and health for Track and Field National Team throwing events.

Kimberley Wood
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MSc Sport & Exercise Physiotherapy, JAMK, Finland

Graduated in 2010, since I have worked with a number of differing athletes, and sports teams (Football, Strongman, Physique, Rugby, various Olympic Athletes ...).

Prior to this course, I successfully ran a Sports Therapy business in London.



Introduction

Who?

Varala High Performance Training Centre in collaboration with SUL, Finnish Olympic Committee, Tampere Research Centre of Sports Medicine and KIHU specifically investigating Hammer throw, Discus throw and Shotput.

What?

Investigating potential interactions between training load and health

When?

Basic preparation period of the season (October – December 2022)



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Why?

Purpose

Using Training and Health monitoring platforms for athletes over time could help facilitate:

- Suitable Training Load based on data
- Help ascertain correlations and/or trends
- Potential Innovations

Hypothesis

H1: Health is correlated with training load, training, testing, recovery, and wellness.

H2: Health is not correlated with training load, training load, training, testing, recovery, and wellness.

Research Question(s)

If there is a correlation between health and training load, training, and wellness?

Any differences in Training Load, Training, Wellness?



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Training Load & Health

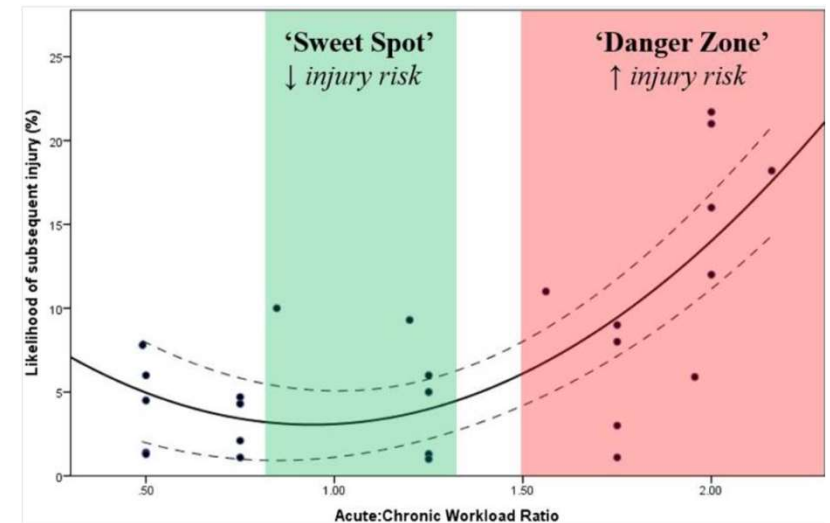
- **Internal TL** = 'biological stressors imposed on the athlete' – Session – RPE Method
- **External TL** = as 'objective measures of work performed' – Strength Vol

Most studies have used the ACWR method to analyse the Training Load. Namely, if ACWR is over 1.5 – if acute training load is higher than chronic = injury risk.

Not many studies have discussed undertraining. However, it must be noted that both inadequate and excessive training = associated with injury

Health = 'A new or recurring symptomatic illness, or the presence of subclinical immunological precursors of symptomatic illness, that was incurred during competition or training, and either receiving medical attention or was self-reported by athletes, regardless of the consequences with respect to absence from competition or training'

Bourdon et al (2017), Gabbett (2016), Schwellnus (2016)



Method

Research Study Design: prospective cohort (Level 3 study design)

Data Collected by: Varala High performance training center will be responsible for collecting & anonymizing the data

Data Collection: Training Monitoring Platform (Champions Corner), Oslo Sports Trauma Research Centre Questionnaire on Health problems, Wellness questionnaire (sleep, recovery, stress, muscle soreness and mood).

Permission for data: Master's Thesis Cooperation formed signed

Permission from Athletes: Participation Information Sheet with all necessary information, Consent form signed (At camp 1 or webropol)

Data timeline: Starting Monday 26.09.2022 for 14 weeks



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Data Description

Training data: Champions Corner:

Training days, sessions and hours, Rest days, Sick days, Travel days, Competition days, Sport training days, Number of throws (all), Number of throws underweight, Number of throws normal weight, Number of throws overweight, Speed training times (running), Plyometrics training sessions, Plyometrics training contacts, Strength training sessions, Strength training volume in Kg and Training load per week.

Wellness Data:

1) How well recovered do you feel yourself at the moment?, 2) How was your sleep quality last night?, 3) How sore are your muscles at the moment?, 4) How stressed do you feel yourself at the moment?, 5) How is your mood at the moment?. (1=extremely poor....10=Perfect)

Health Data: OSTRC-H2

Participation	Modified Training/competition	Performance	Symptoms
<p>Have you had any difficulties participating in training and competition due to injury, illness or other health problems during the past 7 days?</p> <p>a.Full Participation without health problems b.Full participation, but with a health problem c.Reduced Participation due to a health problem d.Could not participate due to a health problem</p>	<p>To what extent have you modified your training or competition due to injury, illness or other health problems during the past 7 days?</p> <p>a.No modification b.To a minor extent c.To a moderate extent d.To a major extent</p>	<p>To what extent has injury, illness or other health problems affected your performance during the past 7 days?</p> <p>a.No effect b.To a minor extent c.To a moderate extent d.To a major extent</p>	<p>To what extent have you experience symptoms/health complaints during the past 7 days?</p> <p>a.No symptoms/health complaints b.To a mild extent c.To a moderate extent d.To a severe extent</p>

Data Definitions

Acute Training Load: $\text{RPE (1-10)} * \text{Training Duration (minute)}$

Chronic Training Load: Load over a period of time

Acute: Chronic Workload Ratio: Acute load of week / acute load of last week (or average if more than 1 week)

Training Monotony: average training load in week / standard deviation of training load in week

Strength Training Volume: Kg

Wellness score: average daily sum of 5 questions

Acute: Chronic Workload Ratio Scores:

<0.8 undertraining, 0.8 – 1.3,
1.3-1.4 overreaching, 1.5
danger

Training Monotony:

1 - 1.5 considered good

Wellness: Z score:

<-1.1 lower than normal, +1 - -
1 normal, >1.1 higher than
normal



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Statistical Analysis

Group 1 = Non ill or non injured

Group 2 = Ill or injured

Acute Training load and Chronic Training Load in a 2 week, 3 week, 4 week loading patterns.

Training Monotony

Throwing Volumes per weight category

Strength Volume / Plyometric Contacts Volume

Injury Severity Score (OSTRC-H2), Illness details (OSTRC-H2),

Wellness Z score

Analysis on SPSS and Microsoft Excel.

Subjects included: 10

Sport: 5 hammer, 2 discus, 3 shot put

Descriptive statistics was the most suitable method to analyse the data. Therefore no further analytical tests were used.

Average scores of Group 1 and Group 2 were not conclusive enough therefore analysis of the individual results was imperative to show a comprehensive overview of the data.

It is imperative to hide the identify of these athletes, so a few individual examples will be shown.



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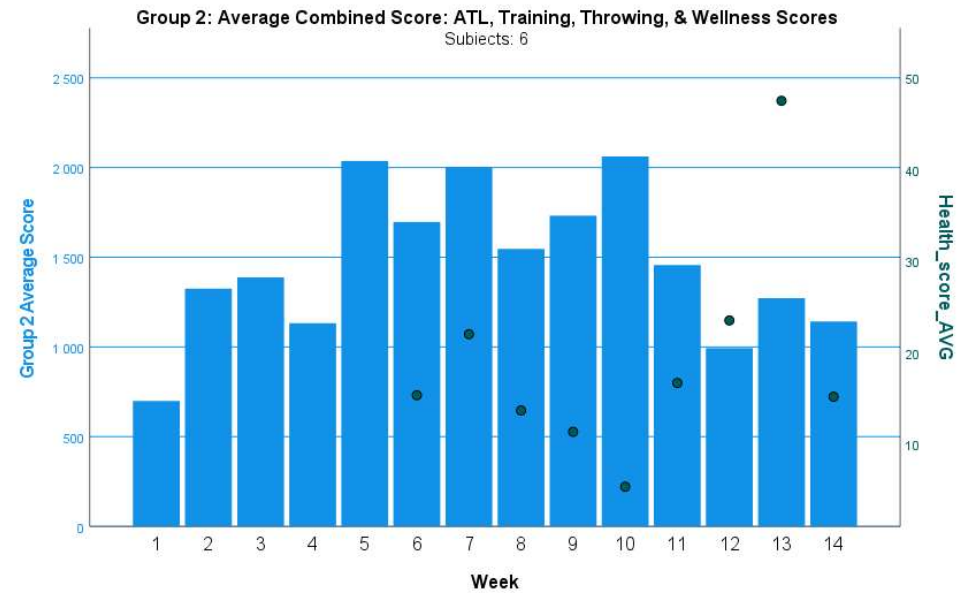
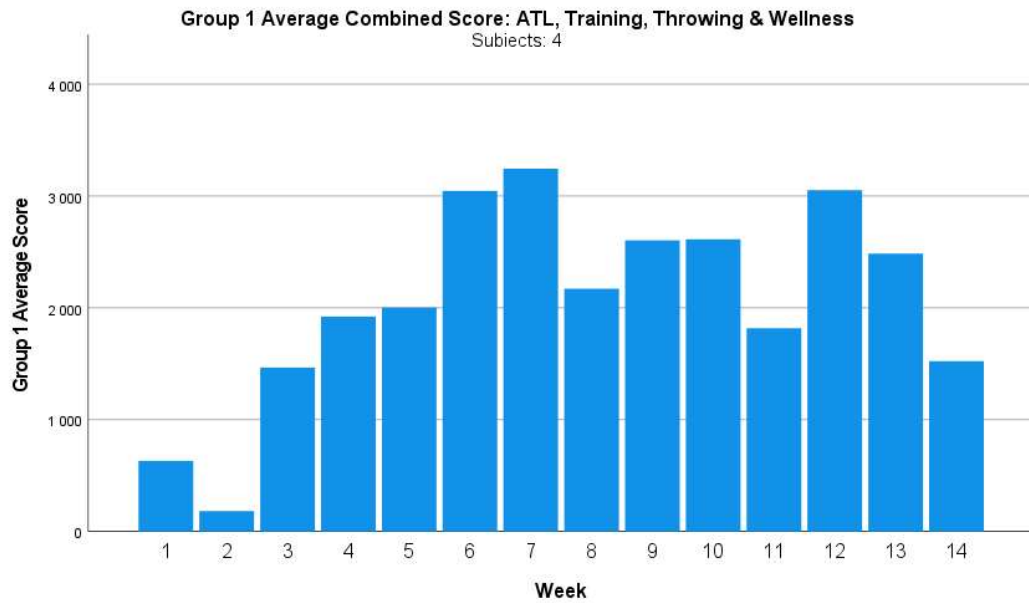
Combined Results



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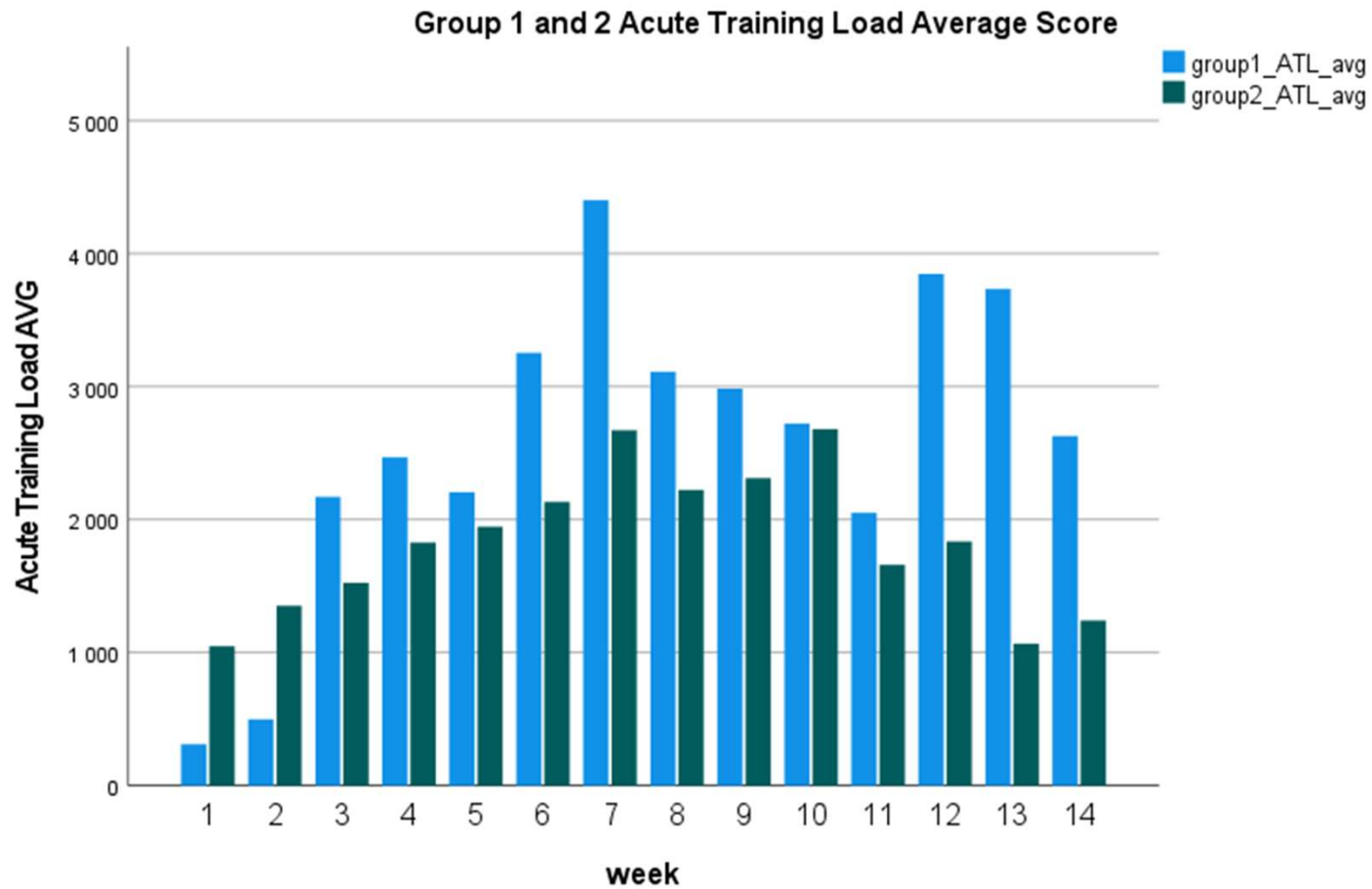
Combined Athlete Averages



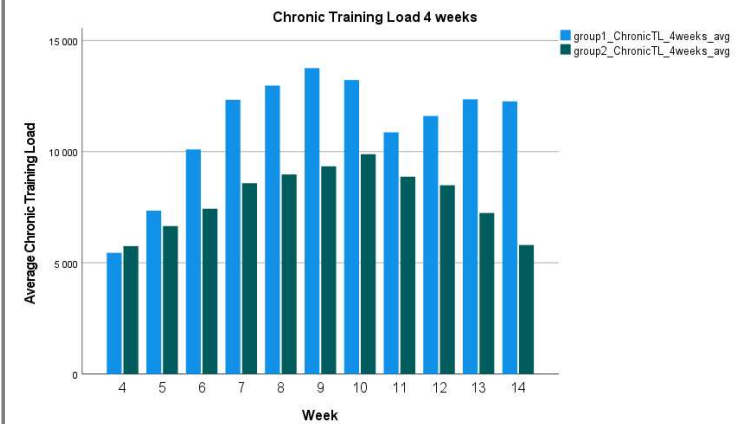
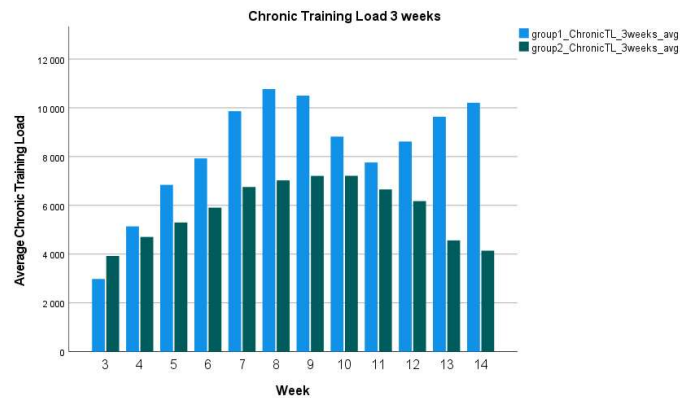
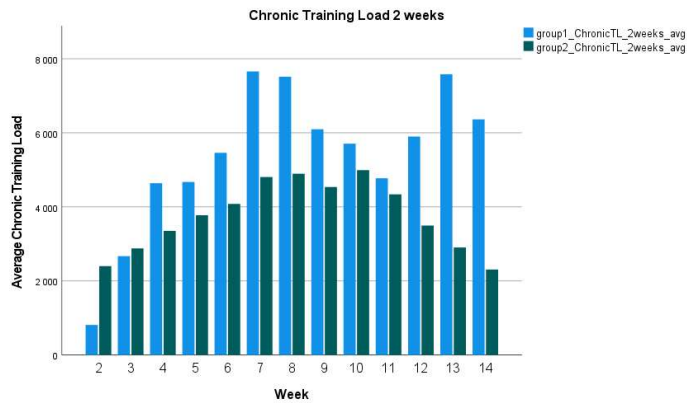
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Acute Training Load



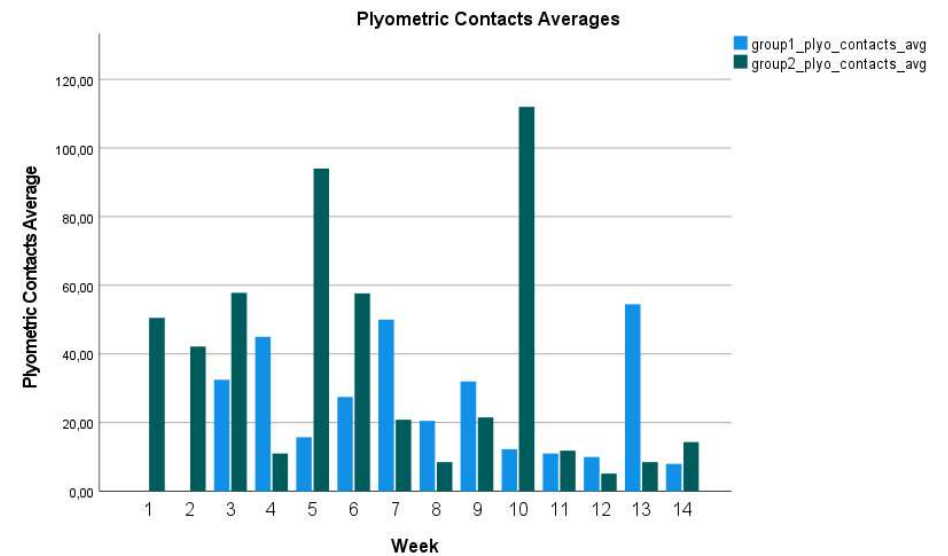
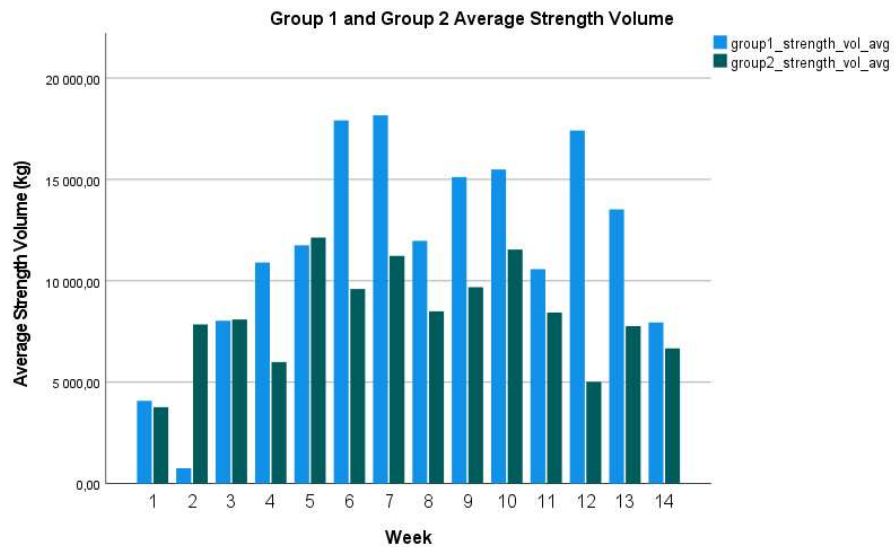
Chronic Training Load



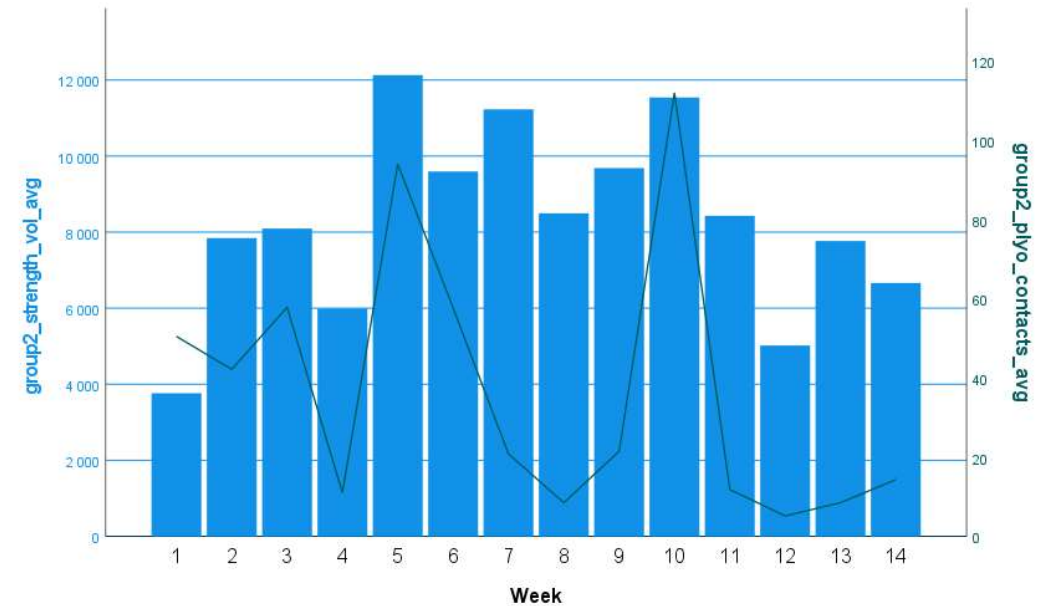
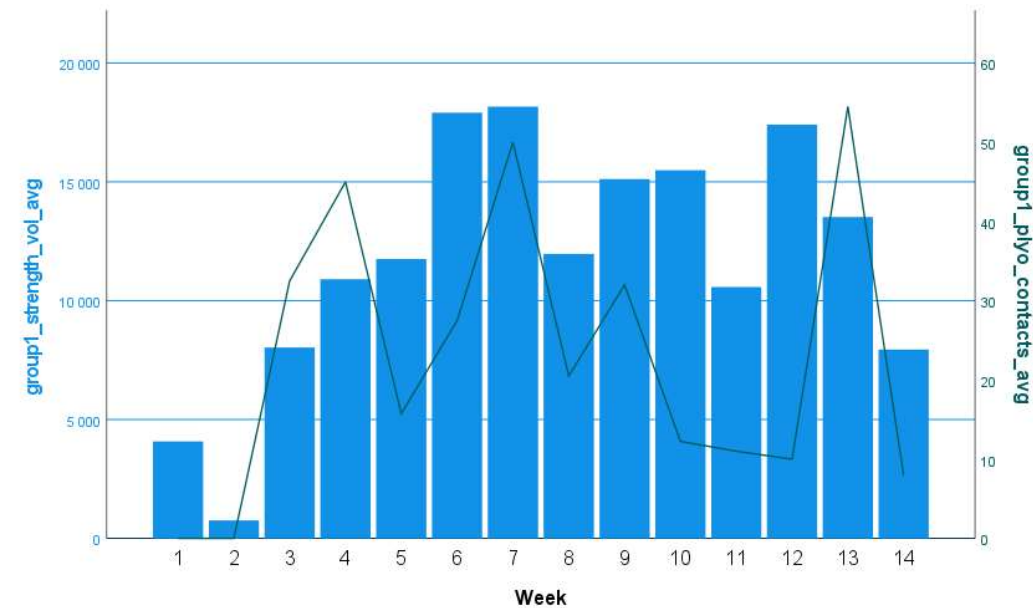
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Strength Volume & Plyometric Contacts



Strength Volume & Plyometric Visual

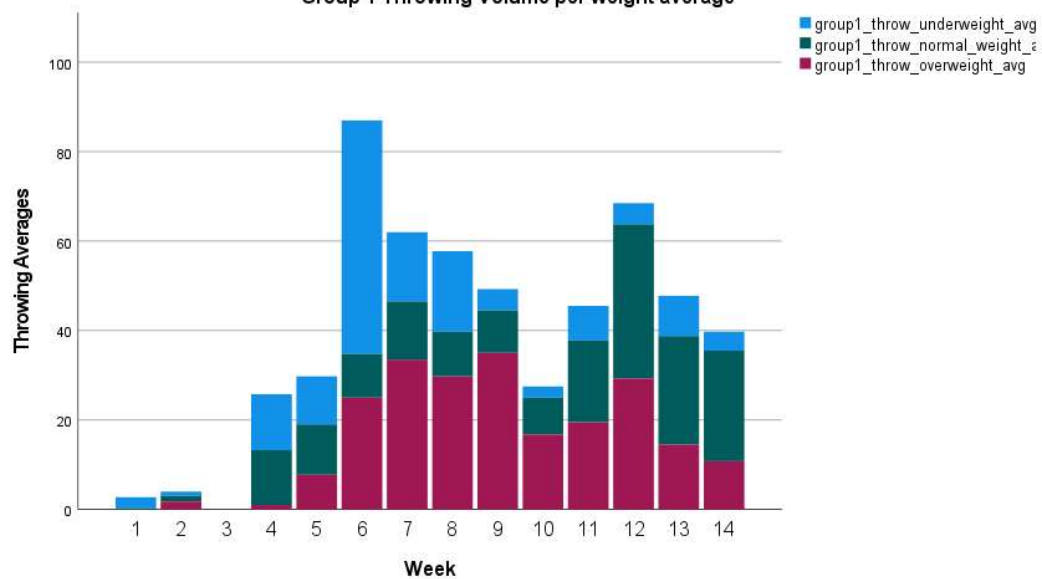


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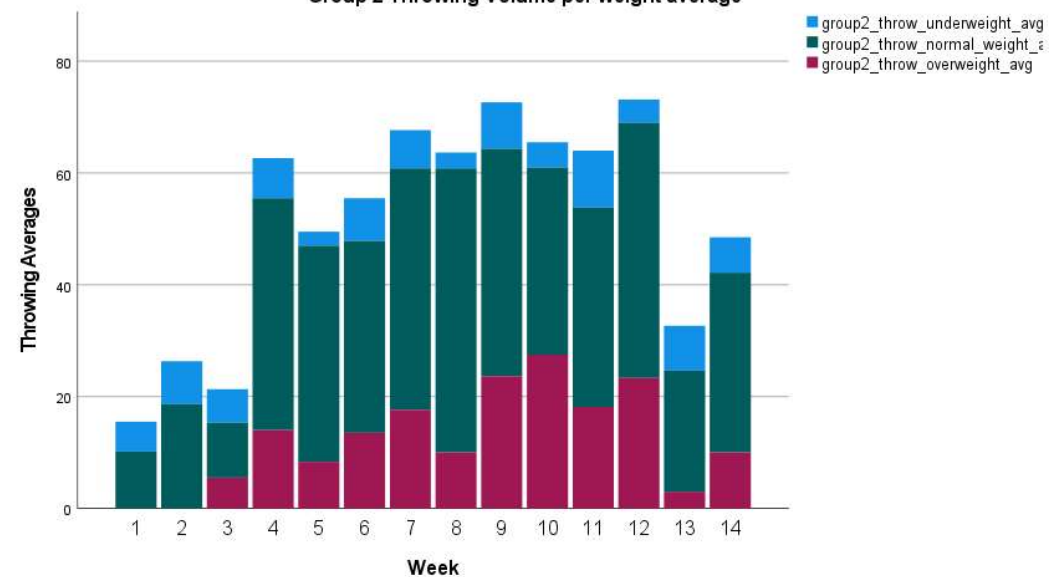


Throwing Volumes

Group 1 Throwing Volume per weight average



Group 2 Throwing Volume per weight average



Individual Results



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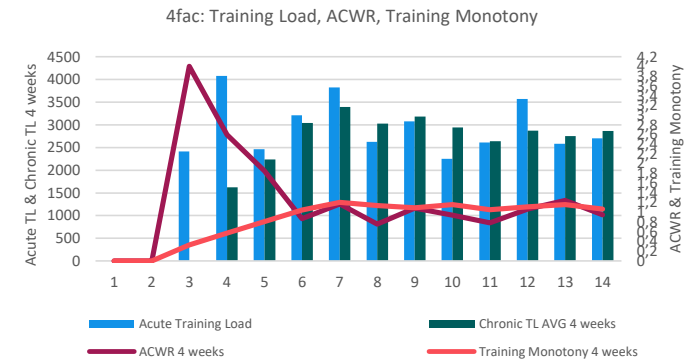
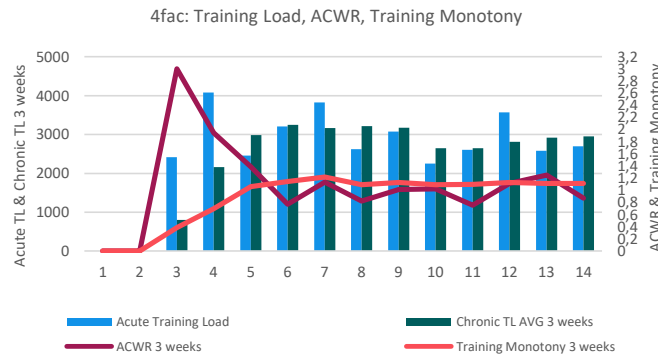
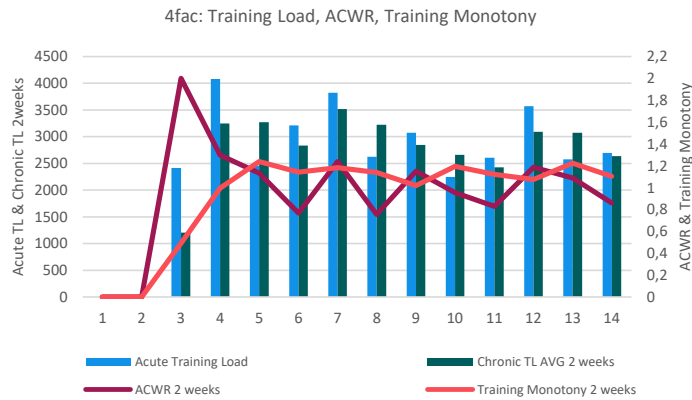
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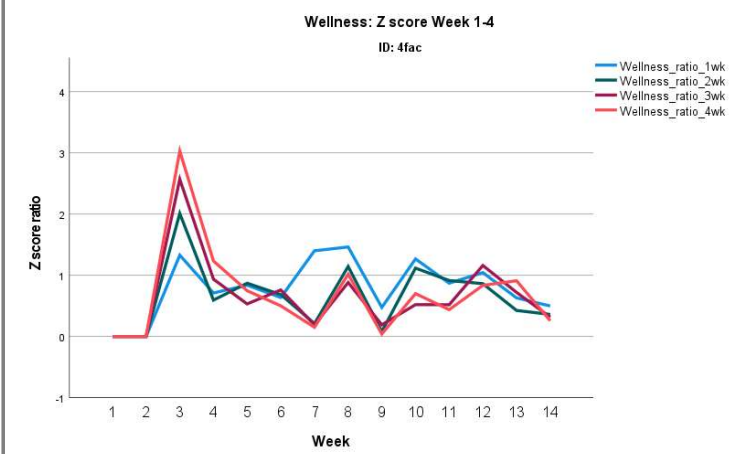
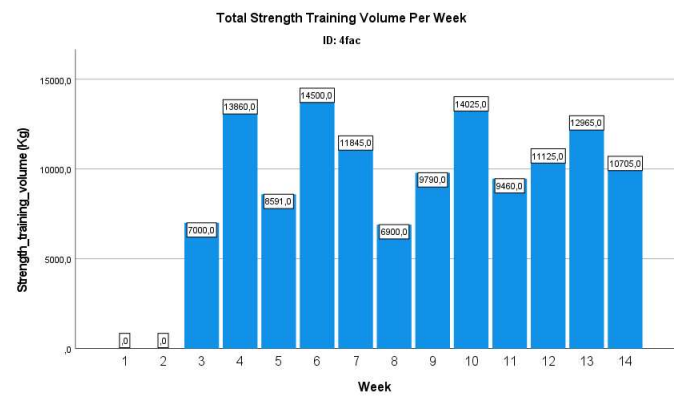
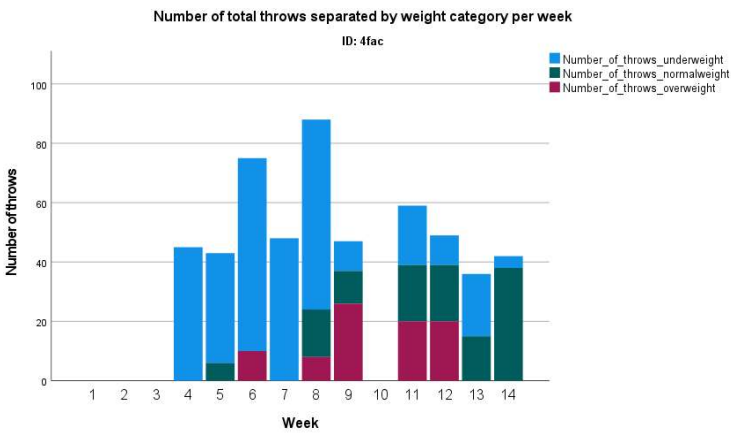
Group 1: Athlete Example



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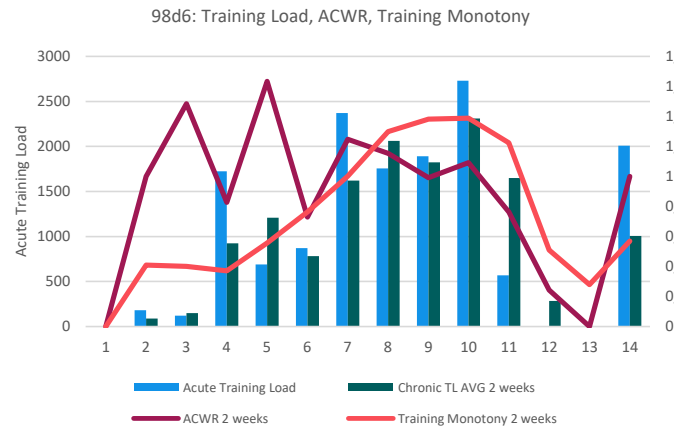
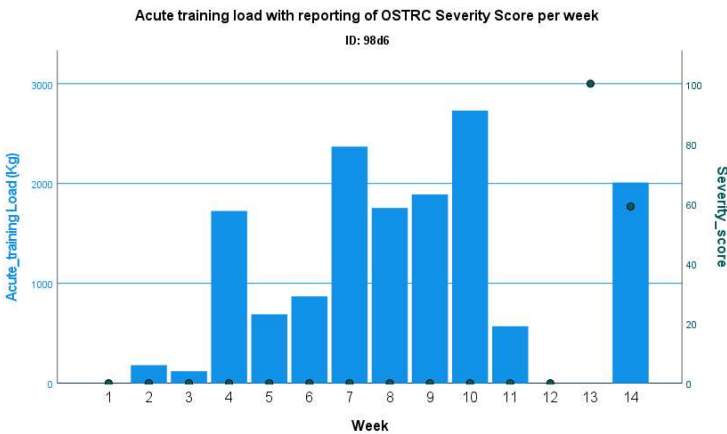
Group 1: Athlete Example



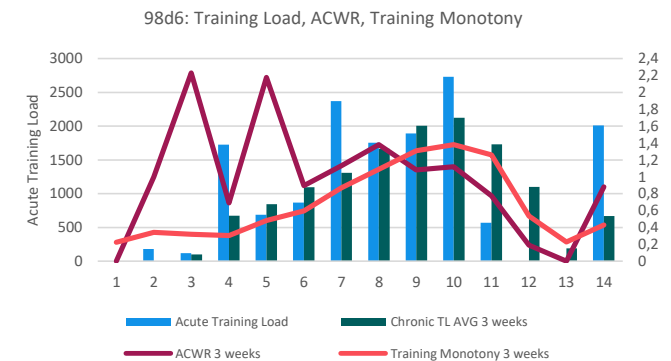
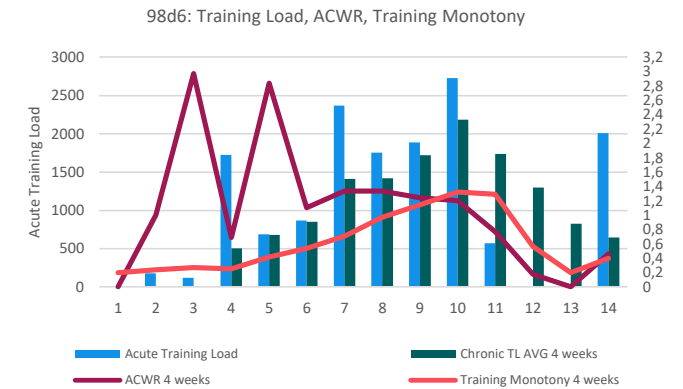
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Group 2: Athlete 1st Example



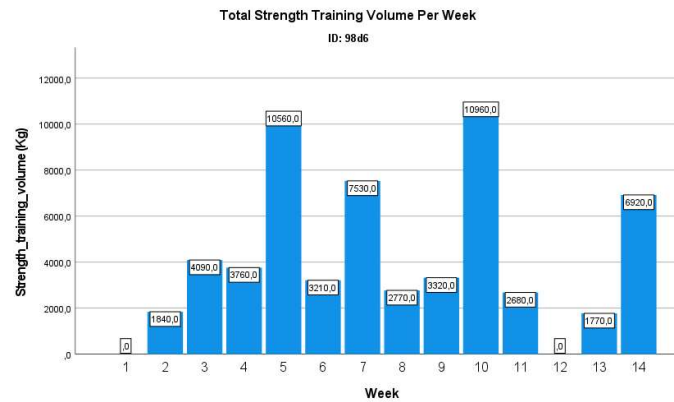
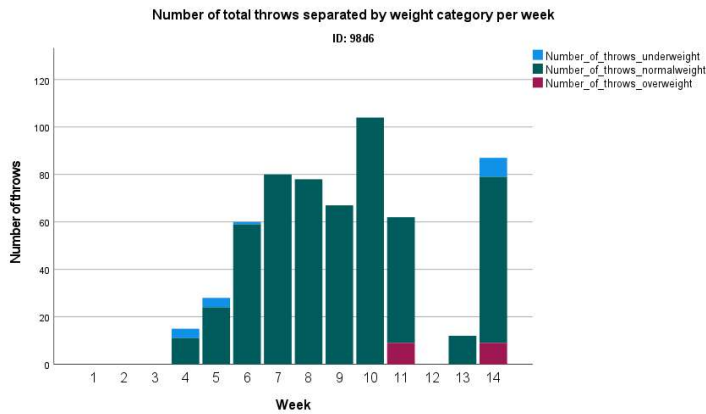
Spikes: 4, 7, 10, 14 | Huge spikes - increases & decreases



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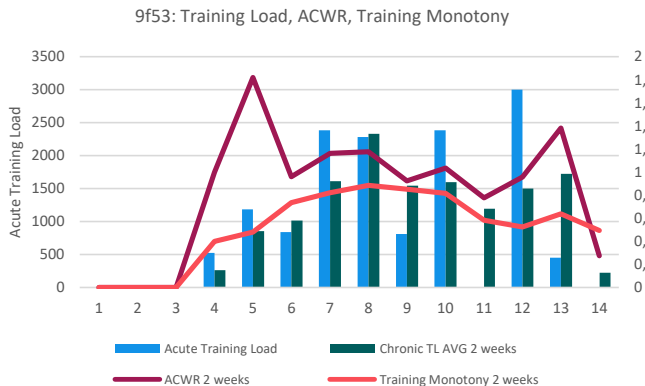
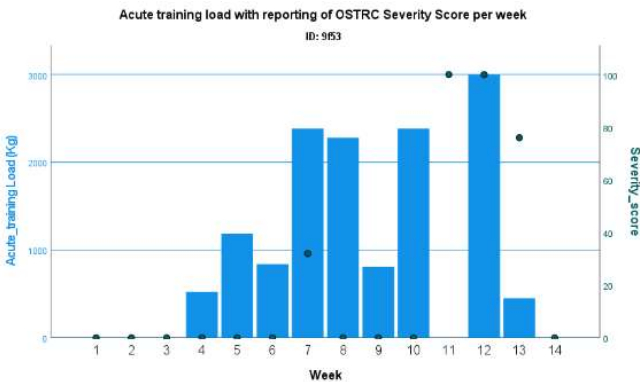
Group 2: Athlete 1st Example



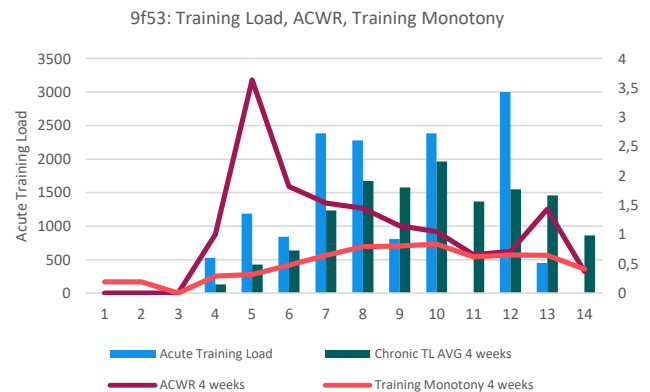
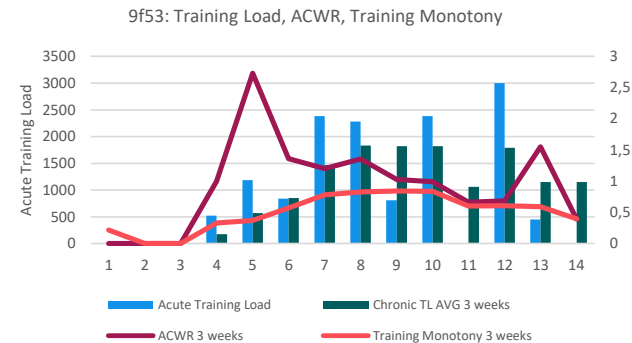
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Group 2: Athlete 2nd Example

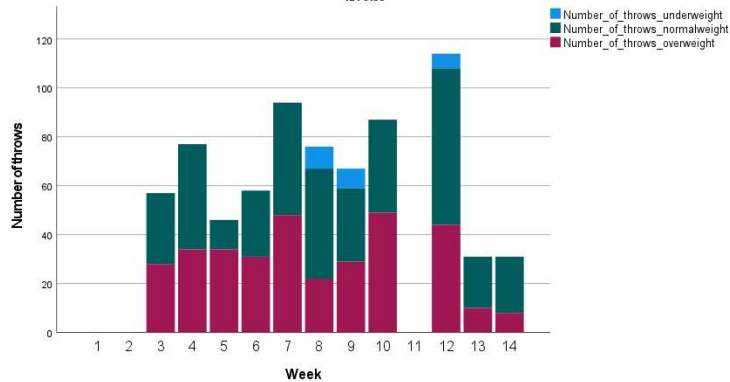


Spikes: 5, 7, 10, 12 | Huge spikes - increases & decreases

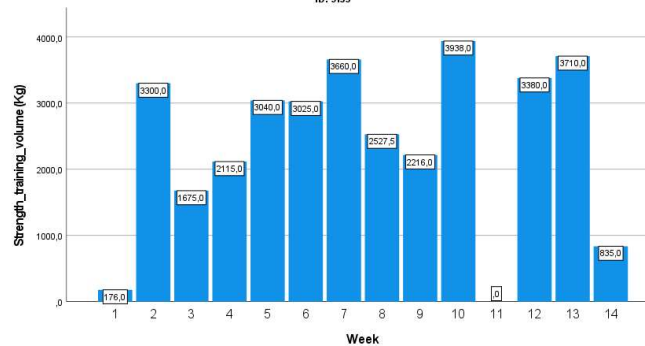


Group 2: Athlete 2nd Example

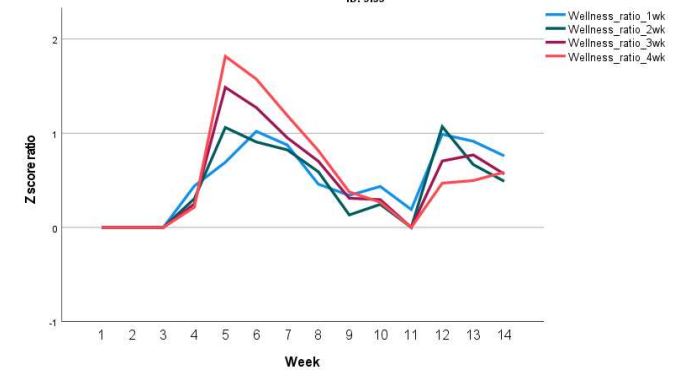
Number of total throws separated by weight category per week
ID: 9153



Total Strength Training Volume Per Week
ID: 9153



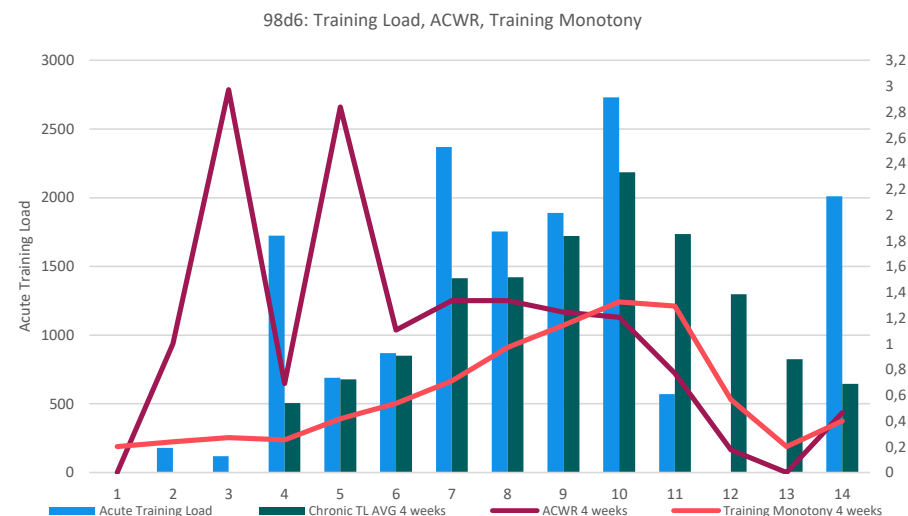
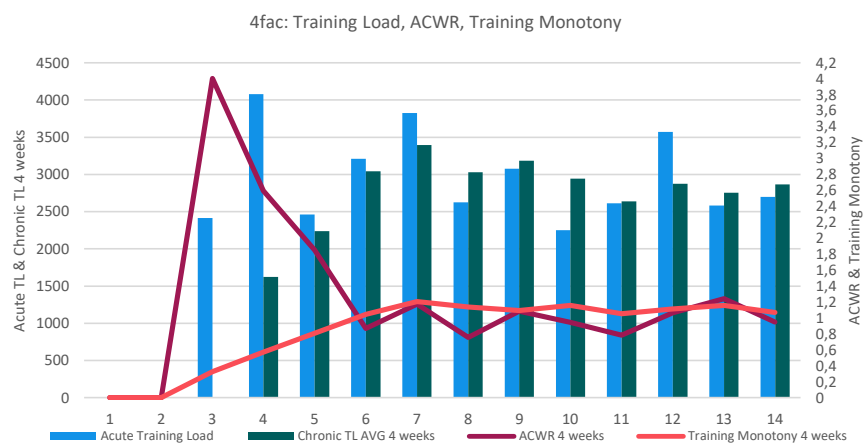
Wellness: Z score Week 1-4
ID: 9153



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Comparison: ATL vs CTL (4wks)



Discussion



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The results have shown there is a correlation between health and training load....

- Group 1 shows gradual progression in Acute Training Load, and a higher chronic loading pattern in all loading patterns than group 2
- Group 2 loads too quickly from week 1 – excessive spikes and drops
- Group 1 clear strength volume difference
- Not much difference between wellness scores from either group or individual
- Group 1 throwing volumes are less in first 6 weeks, predominantly underweight whereas Group 2 volumes are higher predominantly normal weight
- Group 2 had an illness every week from week 6. No sign of adapted training load when returning to play. Shown in all ill athletes.



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Higher Chronic Training load: Research suggests that a stable better chronic pattern could have a preventative effect for injury and illness.

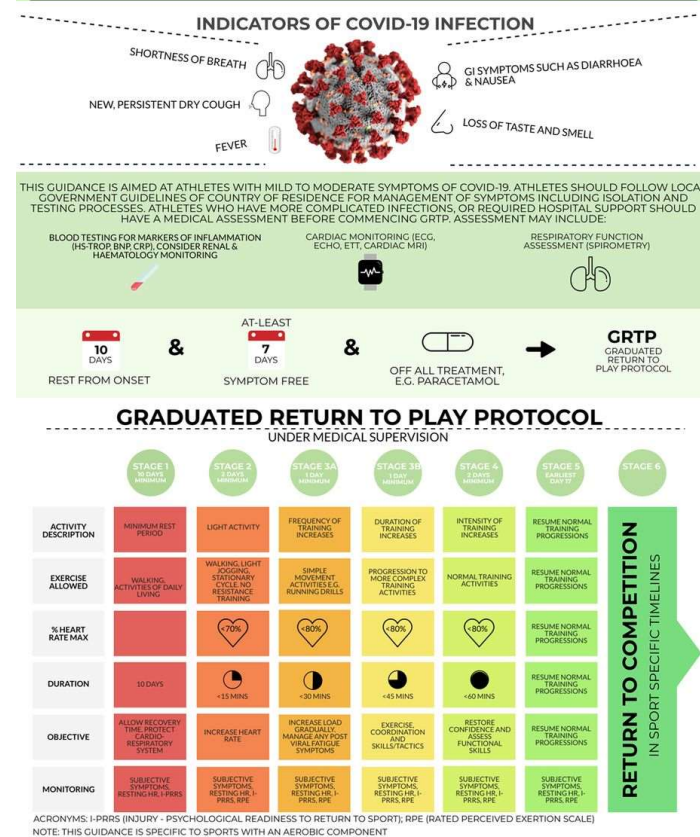
Return to Play guidelines for illness: General

Recommendations are: 1) Return to play should occur only after infection has cleared (no remaining symptoms of muscle pain, general malaise, fever, etc). 2) RTP is a gradual process and only increase training when symptom free, 3) Abstain from all activity during infection. A full return to play protocol could be implemented.

Excessive training load spikes: Rapid increases and sudden drops can lead to risk of illness or injury.

Börjesson et al (2017), Elliott et al (2020), Gabbett (2016) Schwellnus (2016)

COVID-19 GRADUATED RETURN TO PLAY FOR PERFORMANCE ATHLETES: GUIDANCE FOR MEDICAL PROFESSIONALS



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Tampereen
URHEILUAKATEMIA

Conclusion

- This research gives a full picture of combining results between ill and non ill, and looking at individual data gave insights into the training load spikes which showed significant differences in TL, Strength and Throwing Volumes from Group 1 to Group 2.
- Other considerations: Potential learning curve weeks 1-3?, RPE is higher for one athlete than another, response bias?
- It only had 10 subjects, a **bigger population** would be better for combined scores to see further and definitive correlations.
- This study has shown there are **significant spikes** in TL, this needs to be addressed in the future.
- This group would benefit from **better RTP guidelines**, also do the athletes know what this is?
- In the future, it would be beneficial to research a full year to see if the correlations are true, and not only the 14 weeks shown



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