THE EGYM TRAINING CONCEPT

EGYM with clear added value compared to existing providers

	EGYM	other providers
High Training Efficiency		
Automatic training weight determination	✓	-
Periodised training programs	✓	-
Circuit training	✓	✓
Different training methods	✓	✓
Control of the training parameters	✓	✓
Resistance dependent on the joint angle	✓	✓
High User-Friendliness and Safety		
Automatic adaptation to the training progress	✓	-
Automatic training data tracking and analysis	✓	✓
Automatic user recognition	✓	✓
Interactive training control	✓	✓
High Member Motivation and Loyalty		
Social support	✓	-
Structured training program	✓	-
Monitoring of the training success	✓	✓

EGYM PROVIDES A BETTER TRAINING EXPERIENCE FOR THE USER

1. HIGH TRAINING EFFICIENCY

   EGYM provides unique functions to improve the training efficiency

   a. **Circuit training improves strength and endurance simultaneously and therefore saves time**
   b. **Automatic training weight determination ensures an effective stimulus**
   c. **Different training types facilitate a differentiated and effective training**
   d. **Periodized training programs double the training efficiency**
   e. **Control of the crucial training parameters through live-feedback on a display**
   f. **Joint angle dependent resistance leads to an optimal muscle workload**

2. HIGH USER FRIENDLINESS & SAFETY

   EGYM makes the training more comfortable, safer and more professional for the customers

   a. **Automatic user recognition leads to safety and comfort**
   b. **Automatic training data tracking and analysis improves the training and support quality**
   c. **The intense interaction through live-feedback with the device display promotes the self-control**
   d. **Training weight and method are adjusted automatically to the users success**

3. HIGH MEMBER MOTIVATION & LOYALTY

   The EGYM training system provides higher member loyalty through a more motivating and fun training compared to other devices

   a. **Social support in the EGYM community helps to stick to the training program**
   b. **A structured training program leads to more frequent training**
   c. **Monitoring of the training success motivates**

JUSTIFICATION

HIGH TRAINING EFFICIENCY

1a)

CIRCUIT TRAINING

Circuit training improves strength and endurance simultaneously and therefore saves time.

The circuit training as a resistance training organisation form is one of the most efficient training forms. On the one hand no waiting time occurs for a certain training device and on the other hand strength and endurance are simultaneously improved. Since the respective muscle groups are alternately trained no long rests between sets are necessary.The short pauses lead to elevated heart rates and a higher reduction of body fat.

- **Circuit training leads to similar force enhancement but to a higher reduction of body fat in a shorter training time.**
  - Romero-Arenas, S., Blazevich, A.J., Martínez-Pascual, M., Pérez-Gómez, J., Luque, A.J., López-Román, F.J., Alcaraz, P.E. (2013). Effects of high-resistance circuit training in an elderly population. Experimental Gerontology. Volume 48, Issue 3, March 2013, Pages 334–340. http://www.sciencedirect.com/science/article/pii/S0531556513000132
  - Alcaraz, P.E.; Perez-Gomez, J.; Chavarrias, M.; Blazevich, A.J. (2011). Similarity in adaptations to high-resistance circuit vs. traditional strength training in resistance-trained men. *J Strength Cond Res*., Vol.25(9), p.2519-2527. http://www.ncbi.nlm.nih.gov/pubmed/21659889

- **Circuit training improves VO2max similar to exclusive endurance training.**
  - Camargo, M.D.; Stein, R.; Ribeiro, J.P.; Schvartzman, P.R.; Rizzatti, M.O.; Schaan, B.D. (2007). Circuit weight training and cardiac morphology: A trial with magnetic resonance imaging. *Br J Sports Med*, Vol.42(2), p.141-145. http://www.ncbi.nlm.nih.gov/pubmed/17586582

- **Circuit training improves strength and endurance simultaneously.**
  - Kaikkonen, H.; Yrjama, M.; Siljander, E.; Byman, P.; Laukkanen, R. (2000). The effect of heart rate controlled low resistance circuit weight training and endurance training on maximal aerobic power in sedentary adults. *Scand J Med Sci Sports* 10, Vol.10(4), p.211–215. http://www.ncbi.nlm.nih.gov/pubmed/10898265

1b)

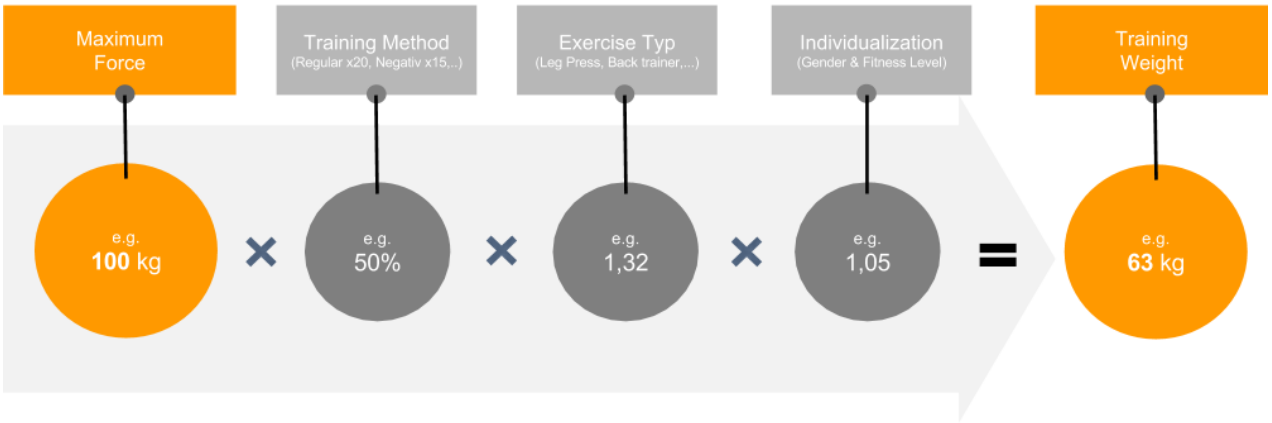
TRAINING WEIGHT DETERMINATION

The automatic determination of the training weight ensures an effective stimulus. The optimal training weight is calculated through an isometric maximum force measurement, training method, training type, sex and the preferred training load. When the force measurement is conducted regularly the training stimulus can assumed to be effective.

- **Just an individualised stimulus leads to the desired training success.**
  - Ingebrigtsen, J., Holtermann, A., & Roeleveld, K. (2009). Effects of load and contraction velocity during three-week biceps curls training on isometric and isokinetic performance. The Journal of Strength & Conditioning Research, 23(6), p.1670-1676
  - Kraemer, W.J. and Ratamess, N.A. (2004). Fundamentals of resistance training: progression and exercise prescription. *Med Sci Sports Exerc,* Vol.36(4), p.674-688. http://www.portalsaudebrasil.com/artigospsb/ativfis025.pdf
  - Fleck, S. and Kraemer, W. (2014). Designing Resistance Training Programs. ISBN-13: 9780736081702. http://www.humankinetics.com/products/all-products/Designing-Resistance-Training-Programs-4th-Edition

BACKUP: Calculation of training resistance

The strength measurement is the basis to calculate the training weights scheduled every 6 training sessions.



1c)

TRAINING TYPES

Different training types make a more differentiated and more effective training possible.

The resistance produced with the help of an electric motor allows more training types which make a more effective, efficient and especially a more differentiated training possible. The following describes the advantages of the respective training types:

REGULAR TRAINING

Constant and similar resistance in con- and eccentric

- **Suitable for beginners and training returners due to less muscle soreness.**
  - Newham, D.J.; Mills, K.R.; Quigley, B.M.; Edwards, R.H. (1983). Pain and fatigue after concentric and eccentric muscle contractions. *Clinical Science*, Vol.64(1), p.55-62. http://europepmc.org/abstract/MED/6822050
  - Newham, D.J.; McPhail, G.; Mills, K.R.; Edwards, R.H.T. (1983). Ultrastructural changes after concentric and eccentric contractions of human muscle. *Journal of the Neurological Sciences*, Vol.61(1), p.109-122. http://www.sciencedirect.com/science/article/pii/0022510X83900588

- **Heart rate gets elevated higher in concentric compared to eccentric.**
  - Mayer, F.; Axmann, D.; Horstmann, T.; Niess, A.; Striegel, H.; Ruf, J.; Dickhuth, H.H. (1999). Metabolic and cardiocirculatory reactions after concentric and eccentric exercise of the shoulder. *Int J Sports Med*, Vol.20(8), p.527-31. http://www.ncbi.nlm.nih.gov/pubmed/10606216

NEGATIVE TRAINING

Eccentric-enhanced resistance.

- **Less increase in systolic blood pressure and heart rate compared to regular training and therefore suitable for persons suffering from hypertension, cardiocirculatory diseases and older people**.
  - LaStayo, P.C.; Ewy, G.A.; Pierotti, D.D.; Johns, R.K.; Lindstedt, S. (2003). The Positive Effects of Negative Work: Increased Muscle Strength and Decreased Fall Risk in a Frail Elderly Population. *The Journals of Gerontology*, Vol.58(5), p.419-424. http://biomedgerontology.oxfordjournals.org.eaccess.ub.tum.de/content/58/5/M419
  - Lindstedt, S.L.; LaStayo, P.C.; Reich, T.E. (2001). When Active Muscles Lengthen: Properties and Consequences of Eccentric Contractions. *Physiology*, Vol.16(6), p.256-261. http://physiologyonline.physiology.org/content/16/6/256

- Mayer, F.; Axmann, D.; Horstmann, T.; Niess, A.; Striegel, H.; Ruf, J.; Dickhuth, H.H. (1999). Metabolic and cardiocirculatory reactions after concentric and eccentric exercise of the shoulder. *Int J Sports Med*, Vol.20(8), p.527-31. http://www.ncbi.nlm.nih.gov/pubmed/10606216

- **Leads to reduction of muscle and tendon injuries.**

  - Kaminski, T.W.; Wabbersen, C.V.; Murphy, R.M. (1998). Concentric versus enhanced eccentric hamstring strength training: Clinical implications. *J Athl Train*, Vol.33(3), p.216-21. http://www.ncbi.nlm.nih.gov/pubmed/16558513
  - Croisier, J-L.; Frothomme, B.; Foidart-Desalle, M.; Godon, B.; Crielaard, L-M. (2001). Treatment of recurrent tendinitis by isokinetic eccentric exercises. *Isokinetics and Exercise Science*, Vol.9(3), p.133-141. http://iospress.metapress.com/content/dn0dg6ml4wyfm14r/
  - Peterson, M.D.; Dodd, D.J.; Alvar, B.A.; Rhea, M.R.; Favre, M. (2008). Undulation training for development of hierarchical fitness and improved firefighter job performance. *J Strength Cond Res*, Vol.22(5), p.1683-1695. http://www.ncbi.nlm.nih.gov/pubmed/18714214
  - Schache, A. (2012). Eccentric hamstring muscle training can prevent hamstring injuries in soccer players. *J Physiother*, Vol.58(1), p.58. http://www.ncbi.nlm.nih.gov/pubmed/22341384
  - Stasinopoulos, D. (2012). Comparing the effects of eccentric training with eccentric training and static stretching in the treatment of patellar tendinopathy. A controlled clinical trial. *Clin Rehabil*, Vol.26 (5), p.423-430. http://www.ncbi.nlm.nih.gov/pubmed/21856721

- **Can improve performance through stiffer tendons.**

  - Lindstedt, S.L.; LaStayo, P.C.; Reich, T.E. (2001). When Active Muscles Lengthen: Properties and Consequences of Eccentric Contractions. *Physiology*, Vol.16(6), p.256-261. http://physiologyonline.physiology.org/content/16/6/256

- **Leads to greater muscle size and strength gains in advanced athletes compared to regular training.**

  - Roig, M.; O'Brien, K.; Kirk, G.; Murray, R.; McKinnon, P.; Shadgan, B.; Reid, W.D. (2009).The effects of eccentric versus concentric resistance training on muscle strength and mass in healthy adults: A systematic review with meta-analysis. *Br J Sports Med*, Vol.43(8), p.556-568. http://www.ncbi.nlm.nih.gov/pubmed/18981046
  - Kaminski, T.W.; Wabbersen, C.V.; Murphy, R.M. (1998). Concentric versus enhanced eccentric hamstring strength training: Clinical implications. *J Athl Train*., Vol.33(3), p.216-21. http://www.ncbi.nlm.nih.gov/pubmed/16558513

ADAPTIVE TRAINING

Variable resistance. The weight is dynamically reduced during the repetition by up to 20% if a repetition can no longer be carried out cleanly. Additionally depending on the chosen intensity level the resistance is reduced constantly every rep by 2.5% (low), 1.25% (medium) or 0% (high).

- **The distribution of muscle growth hormones is 2-3 times as high, with training past muscle failure (= adaptive) than to the repetition maximum.**
  - Ahtiainen, J. P.; Pakarinen, A.; Kraemer, W.J.; Häkkinen, K. (2003). Acute Hormonal and Neuromuscular Responses and Recovery to Forced vs. Maximum Repetitions Multiple Resistance Exercises. *International Journal of Sports Medicine*, Vol.24(6), p.410-418. http://www.ncbi.nlm.nih.gov/pubmed/12905088

- **The maximum force (+50%) and the muscle power (+35%) is increased when trained up to muscle failure.**
  - Drinkwater, E. J.; Lawton, T.W.; Lindsell, R.P.; Pyne, D.B.; Hunt, P.H.; McKenna, M.J. (2005). Training leading to repetition failure enhances bench press strength gains in elite junior athletes. *The Journal of Strength & Conditioning Research*, Vol.19(2), p.382-388. http://www.ncbi.nlm.nih.gov/pubmed/15903379

- **High intensive single-set training (= adaptive) is significantly more efficient than a less intensive three-set training (= in one-third of the time 90% of the effect).**
  - Giessing, J. (2005). Intense single-set training for maximum muscular hypertrophy in bodybuilding. In J. Giessing, M. Fröhlich; P. Preuss (eds.), *Current results of strength training research* (p.103-113). Göttingen: Cuvillier. Google books Link

ISOKINETIC TRAINING

Variable resistance at each joint angle in both concentric and eccentric.
The (maximum) speed of movement is constant. The concentric must be guided by the training itself, the eccentricity is driven solely by the device.
A target corridor indicates how much force must be applied in order to initiate a training about effective stimulus.

- **Isokinetic training leads to a twice as high increase in strength compared to isotonic training.**
  - Golik-Peric, D.; Drapsin, M.; Obradovic, B.; Drid, P. (2011). Short-Term Isokinetic Training Versus Isotonic Training: Effects on Asymmetry in Strength of Thigh Muscles. *J Hum Kinet*, Vol.30, p.29–35. http://www.ncbi.nlm.nih.gov/pubmed/23486358
  - Pipes, T.V. and Wilmore, J.H. (1975). Isokinetic vs isotonic strength training in adult men. *Medicine & Science in Sports*, Vol.7(4), p.262-274. http://www.ncbi.nlm.nih.gov/pubmed/1235149

- **Isokinetic Training is more effective in resolving muscle imbalances as isotonic training.**
    - Golik-Peric, D.; Drapsin, M.; Obradovic, B.; Drid, P. (2011). Short-Term Isokinetic Training Versus Isotonic Training: Effects on Asymmetry in Strength of Thigh Muscles. *J Hum Kinet*, Vol.30, p.29–35. http://www.ncbi.nlm.nih.gov/pubmed/23486358

- **Ideal for people with orthopedic problems.**
    - Gur, H.; Cakun, N.; Akova, N.; Okay, E.; Kucukoglu, S. (2002). Concentric versus combined concentric – eccentric isokinetic training: effects on functional capacity and symptoms in patients with osteoarthrosis of the knee. *Archive of Physical Medicine and Rehabilitation*, Vol.83(3), p.308–316. http://www.archives-pmr.org/article/S0003-9993(02)69160-9/abstract

Explonic

The training method “Explonic” is characterized by a relatively low training weight and very fast movement velocity for maximal acceleration and power output. It is designed for improvements in tasks of daily living and also sportive tasks. A short warm up phase with six regular repetitions is conducted before the training.

- **To ensure health of elderly people the training at the muscles optimal power output is most effective.**
  - Izquierdo, Mikel (2014). Brief review: Muscle power training in the institutionalized fraid: a new approach to counteracting functional declines and very late-life disability. *Current Medical Research & Opinion* (Vol. 30, 7), p. 1385-1390. http://www.tandfonline.com/doi/abs/10.1185/03007995.2014.908175

- **The muscle power output decreases much faster compared to the maximum strength during the ages. Simultaneously the muscle power output is more important for independency and quality of life for elderly people.**
  - Izquierdo, M.; Antón, M.M. (1999). Maximal strength and power characteristics in isometric and dynamic actions of the upper and lower extremities in middle-aged and older men. *Acta Physiologica Scandinavica* (Vol. 167, 1), p. 57-68. https://www.researchgate.net/publication/12780498_Maximal_strength_and_power_characteristics_in_isometric_and_dynamic_actions_of_the_upper_and_lower_extremities_in_middle-aged_and_older_men

- **Training with moderate weight and maximal movement velocity increases not only the performance in sports tasks but moreover also in tasks of daily life.**
  - Badillo, J.J.G; Blanco, F.P.; Rosell, D.R.; Sánchez-Medina, L. (2014). Effects of Velocity-Based Resistance Training on young Soccer Players of Different Ages. *The Journal of Strength and Conditioning Research* (Vol.29, 5), p. 1329-1338. http://journals.lww.com/nsca-jscr/Abstract/2015/05000/Effects_of_Velocity_Based_Resistance_Training_on.23.aspx
  - Cadore, E.L.; Moneo, A.B.B.; Mensat, M.M.; Munoz, A.R.; Casas-Herrero, A.; Rodriguez-Manas, L.; Izquierdo, M. (2014). Positive effects of resistance training in frail elderly patients with dementia after long-term physical restraint. *The official Journal of the American Aging Association* (Vol. 36, 2), p. 801-811. https://link.springer.com/article/10.1007%2Fs11357-013-9599-7
  - Wilson, G.J.; Newton, R.U.; Murphy, A.J.; Humphries, B.J. (1993). The optimal training load for the development of dynamic athletic performance. *Medicine and Science in Sports and Exercise* (Vol. 25, 11). p. 1279-1286. http://europepmc.org/abstract/MED/8289617

1d)

TRAINING PROGRAMS

The use of specific periodised training programs let the customers achieve their training goals

Depending on the user's training goal, training preferences, gender and level of performance of the device software creates individually periodized training programs. These training programs are structured according to the latest sports science training principles.

For reasons of time such complex training programs can not be created individually within a typical customer care process in a gym. In addition, the training and experience level among the coaches usually strongly varies, which can easily lead to training plans with conflicting training principles.

PROGRAM PRINCIPLES

The five EGYM specific training types (regular, negativ, adative, isokinetic and explonic) are periodized and combined with goal specific training parameters based on the following training principles:

MUSCLE GAIN

Goal: Increase muscle volume

- **Eccentric-enhanced resistance for a better muscle growth stimulus.**
  - Norrbrand, L., Fluckey, J. D., Pozzo, M., Tesch, P. A. (2008). Resistance training using eccentric overload induces early adaptations in skeletal muscle size. European Journal of Applied Physiology, 102(3), S. 271-281. http://www.ncbi.nlm.nih.gov/pubmed/17926060
  - Farthing, J. P. & Chilibeck, P. D. (2003). The effects of eccentric and concentric training at different velocities on muscle hypertrophy. European Journal of Applied Physiology, S.89(6), 578-586. http://www.ncbi.nlm.nih.gov/pubmed/12756571

- **Training to/ past muscle failure for an high anabolic stimulus in a short training time.**
  - Atherton, P.J. and Smith, K. (2012). Muscle protein synthesis in response to nutrition and exercise. *J Physiol*, Vol.590(5), p.1049-1057. http://www.ncbi.nlm.nih.gov/pubmed/22289911
  - Schoenfeld, B.J. (2013). Potential mechanisms for a role of metabolic stress in hypertrophic adaptations to resistance training. Sports Med, 43(3): p.179-94. http://www.ncbi.nlm.nih.gov/pubmed/23338987

- **High intensity and slow speed of movement for high muscle activation with low risk of injury.**

- Giessing, J. (2003). Training for muscular hypertrophy: A comparison of high and low-volume approaches in women. In J. Giessing, M. Fröhlich; P. Preuss (eds.), *Current results of strength training research*. Göttingen: Cuvillier. Google books Link
- Kraemer, W.J.; Adams, K.; Cafarelli, E.; Dudley, G.A.; Dooley, C.; Feigenbaum, M.S.; Franklin, B.; Fry, A.C.; Hoffman, J.R.; Newton, R.U.; Potteiger, J.; Stone, M.H.; Ratamess, N.A.; Triplett-McBride, T. (2002). American College of Sports Medicine position stand. Progression models in resistance training for healthy adults. *Medicine and Science in Sports and Exercise,* Vol.34(2), p.364-380. http://europepmc.org/abstract/MED/11828249
- Toigo, M. and U. Boutellier (2006). New fundamental resistance exercise determinants of molecular and cellular muscle adaptations. *Eur J Appl Physiol,* Vol.97(6), p.643-663. http://www.ncbi.nlm.nih.gov/pubmed/16845551

LOSE WEIGHT

Goal: Get slim and lose fat

- **High number of repetitions with high motion speed to achieve high total work and thus a high total energy expenditure.**
  - Buitrago, S.; Wirtz, N.; Yue, Z.; Kleinöder, H.; Mester, J. (2013). Mechanical load and physiological responses of four different resistance training methods in bench press exercise. *J Strength Cond Res*, Vol.27(4), p.1091-100. http://www.ncbi.nlm.nih.gov/pubmed/22692106
  - Garatachea, N.; Jimenez, A.; Bresciani, G.; Marino, N. A.; Gonzalez-Gallego, J.; De Paz, J.A. (2007). The effects of movement velocity during squatting on energy expenditure and substrate utilization in whole-body vibration. *Journal of Strength and Conditioning Research*, Vol.21(2), p.594-598. http://journals.lww.com/nsca-jscr/Abstract/2007/05000/THE_EFFECTS_OF_MOVEMENT_VELOCITY_DURING_SQUATTING.53.aspx
  - Kang, J.; Hoffmann, J.R.; Spiering, B.A.; Rundell, K.W.; Nioka, S.; Cooper, J.; Chance, B. (2005). Evaluation of physiological responses during recovery following three resistance exercise programs. *Journal of Strength and Conditioning Research*, Vol.19(2), p.305-309. http://europepmc.org/abstract/MED/15903367

- **Resistance training to muscle failure to prevent the normal decline in fat-free mass, power and strength in diet.**
  - Kraemer, W.J.; Volek, J.S.; Clark, K.L.; Gordon, S.E.; Puhl, S.M.; Koziris, L.P.; McBride, J.M.; Triplett-McBride, N.T.; Putukian, M.; Newton, R.U.; Häkkinen, K.; Bush, J.A.; Sebastianelli, W.J. (1999). Influence of exercise training on physiological and performance changes with weight loss in men. Med Sci Sports Exerc, Vol.31(9), p.1320–1329. http://www.ncbi.nlm.nih.gov/pubmed/10487375

- **Training to muscle failure for a higher aerobic, anaerobic and recovery energy expenditure than non-fatiguing lifting.**

- Scott, C.B. and Earnest, C.P. (2011). Resistance Exercise Energy Expenditure is Greater with Fatigue as Compared to Non-Fatigue. *Journal of Exercise Physiology Online*, Vol.14(1), p.1-10. http://opus.bath.ac.uk/29925/
- Thornton, M.K. and Potteiger, J.A. (2002). Effects of resistance exercise bouts of different intensities but equal work on EPOC. *Med Sci Sports Exerc*, Vol.34(4), p.715-722. http://www.ncbi.nlm.nih.gov/pubmed/11932584

GENERAL FITNESS

Goal: Gently increase strength for activities of daily life ("active aging")

- **High-speed concentric movements and loads that optimizes muscle power output to improve functional capacity, muscle performance and quality of life among elderly.**
  - Reid, K.F., Martin, K.I., Doros, G., Clark, D.J., Hau, C., Patten, C., Phillips, E.M., Frontera, W.R., Fielding, R.A.. (2015). Comparative effects of light or heavy resistance power training for improving lower extremity power and physical performance in mobility-limited older adults. *J Gerontol A Biol Sci Med Sci*; 70(3): p.374-80. http://www.ncbi.nlm.nih.gov/pubmed/25199912
  - Izquierdo, M., Cadore, E.L. (2014). Muscle power training in the institutionalized frail: a new approach to counteracting functional declines and very late-life disability. *Curr Med Res Opin*; 30(7): p.1385-90. http://www.ncbi.nlm.nih.gov/pubmed/24666003
  - Ramírez-Campillo, R., Castillo, A., de la Fuente, C.I., Campos-Jara, C., Izquierdo, M. (2014). High-speed resistance training is more effective than low-speed resistance training to increase functional capacity and muscle performance in older women. Exp Gerontol, 58: p.51-7. http://www.ncbi.nlm.nih.gov/pubmed/25014621

- **Slow intensity progression: muscular endurance to hypertrophy to maximum strength.**
  - Campos, G. E.; Luecke, T. J.; Wendelin, H. K.; Toma, K.; Hagerman, F. C.; Murray, T. F.; Ragg, K. E.; Ratamess, N. A.; Kraemer, W. J.; Staron, R. S. (2002). Muscular adaptations in response to three different resistance-training regimes: specificity of repetition maximum training zones. *European Journal of Applied Physiologie*, Vol.88(1-2), p.50-60. http://www.ncbi.nlm.nih.gov/pubmed/12436270
  - Kraemer, W.J.; Adams, K.; Cafarelli, E.; Dudley, G.A.; Dooley, C.; Feigenbaum, M.S.; Franklin, B.; Fry, A.C.; Hoffman, J.R.; Newton, R.U.; Potteiger, J.; Stone, M.H.; Ratamess, N.A.; Triplett-McBride, T. (2002). American College of Sports Medicine position stand. Progression models in resistance training for healthy adults. *Medicine and Science in Sports and Exercise,* Vol.34(2), p.364-380. http://europepmc.org/abstract/MED/11828249
  - Fleck, S. and Kraemer, W. (2014). Designing Resistance Training Programs. ISBN-13: 9780736081702. http://www.humankinetics.com/products/all-products/Designing-Resistance-Training-Programs-4th-Edition

ATHLETIC/ PERFORMANCE

Goal: Increase maximum strength and power without gaining muscle size

- **Training with loads that maximize mechanical peak power output for most effective strength and power improvement.**
  - Wilson, G.J.; Newton, R.U.; Murphy, A.J.; Humphries, B.J. (1993). The optimal training load for the development of dynamic athletic performance. *Medicine and Science in Sports and Exercise*, Vol.25(11), p.1279-1286. http://europepmc.org/abstract/MED/8289617
  - Aagaard, P.; Simonsen, E.B.; Andersen, J.L.; Magnusson, P.; Dyhre-Poulsen, P. (2002). Increased rate of force development and neural drive of human skeletal muscle following resistance training. *Journal of Applied Physiology*, Vol.93(4), p.1318-1326. http://jap.physiology.org/content/93/4/1318

- **Training to failure with high reps and fast speed of movement for long-term muscular endurance enhancements and strength gains.**
  - Tan, B. (1999). Manipulating Resistance Training Program Variables to Optimize Maximum Strength in Men: A Review. *Journal of Strength and Conditioning Research,* Vol.13(3), p.289-304. http://journals.lww.com/nsca-jscr/Abstract/1999/08000/Manipulating_Resistance_Training_Program_Variables.19.aspx
  - Campos, G. E.; Luecke, T. J.; Wendelin, H. K.; Toma, K.; Hagerman, F. C.; Murray, T. F.; Ragg, K. E.; Ratamess, N. A.; Kraemer, W. J.; Staron, R. S. (2002). Muscular adaptations in response to three different resistance-training regimes: specificity of repetition maximum training zones. *European Journal of Applied Physiologie*, Vol.88(1-2), p.50-60. http://www.ncbi.nlm.nih.gov/pubmed/12436270

- **Increasing the the rate of force development to improve athletic performance.**
  - Marques, M. C., Izquierdo, M., Van den Tillaar, R., Moir, G. L., Sanchez-Medina, L., & Gonzalez-Badillo, J. J. (2014a). The reliability of force-time variables recorded during vertical jump performance and their relationship with jump height in power trained athletes: original research article. International Sport Med Journal, 15(2), p.146-155. http://reference.sabinet.co.za/sa_epublication_article/ismj_v15_n2_a4

- **Isokinetic resistance for a safe training to improve rate of force development (RFD).**
  - Connelly, D. M., & Vandervoort, A. A. (2000). Effects of isokinetic strength training on concentric and eccentric torque development in the ankle dorsiflexors of older adults. The journals of gerontology. Series A, Biological sciences and medical sciences, 55(10), p.465-72. http://www.ncbi.nlm.nih.gov/pubmed/11034219

BODYSHAPING

Goal: Gaining muscles and losing fat at the same time

- **Low to moderate load resistance training to muscle failure for muscle growth and high total calorie consumption.**
  - Schoenfeld, B.J., Peterson, M.D., Ogborn, D., Contreras, B., Sonmez, G.T. (2015). Effects of Low- vs. High-Load Resistance Training on Muscle Strength and Hypertrophy in Well-Trained Men. J Strength Cond Res; 29(10): p.2954-63. http://www.ncbi.nlm.nih.gov/pubmed/25853914
  - Scott, C.B. and Earnest, C.P. (2011). Resistance Exercise Energy Expenditure is Greater with Fatigue as Compared to Non-Fatigue. *Journal of Exercise Physiology Online*, Vol.14(1), p.1-10. http://opus.bath.ac.uk/29925/
  - Kang, J.; Hoffmann, J.R.; Spiering, B.A.; Rundell, K.W.; Nioka, S.; Cooper, J.; Chance, B. (2005). Evaluation of physiological responses during recovery following three resistance exercise programs. *Journal of Strength and Conditioning Research*, Vol.19(2), p.305-309. http://europepmc.org/abstract/MED/15903367
  - Thornton, M.K. and Potteiger, J.A. (2002). Effects of resistance exercise bouts of different intensities but equal work on EPOC. *Med Sci Sports Exerc*. Vol.34(4), p.715-22. http://www.ncbi.nlm.nih.gov/pubmed/11932584

- **Eccentric-enhanced resistance for a better muscle growth stimulus.**
  - Farthing, J. P. & Chilibeck, P. D. (2003). The effects of eccentric and concentric training at different velocities on muscle hypertrophy. European Journal of Applied Physiology, S.89(6), 578-586. http://www.ncbi.nlm.nih.gov/pubmed/12756571

- **High-intensity training for a new anabolic stimulus and strength increase.**
  - Schoenfeld, B.J. (2013). Potential mechanisms for a role of metabolic stress in hypertrophic adaptations to resistance training. Sports Med, 43(3): p.179-94. http://www.ncbi.nlm.nih.gov/pubmed/23338987

METABOLIC FIT

Goal: Training muscular endurance of bigger muscle groups to regulate glucose level.

- **EGYM Metabolic Fit program reduces the HbA1c-value on average by 10% while also reducing the body weight up to 3 kilo.**
  - Fact Sheet Diabetes Study https://drive.google.com/drive/folders/0B5xeaNVapYTJTS10R2Zjb04zaXc

- **Short and intensive sets, as well as short breaks between the repetitions to keep the systolic blood pressure low.**
    - Baum K, Rüther T, Essfeld D.(2003). Reduction of blood pressure response during strength training through intermittent muscle relaxations. Int J Sports Med.; 24(6): 441-5. https://www.ncbi.nlm.nih.gov/pubmed/12905093
    - Lamotte M, Niset G, van de Borne P. (2005). The effect of different intensity modalities of resistance training on beat-to-beat blood pressure in cardiac patients. Eur J Cardiovasc Prev Rehabil;12(1):12-7. https://www.ncbi.nlm.nih.gov/pubmed/15703501
    - Lamotte M, Fleury F, Pirard M, Jamon A, van de Borne P. (2010). Acute cardiovascular response to resistance training during cardiac rehabilitation: effect of repetition speed and rest periods. Eur J Cardiovasc Prev Rehabil. 2010 Jun;17(3):329-36. https://www.ncbi.nlm.nih.gov/pubmed/20104178

- **Muscle endurance training more effective than hypertrophy training for improvement of HbA1c-value.**
    - Hillebrecht et al: Vergleich der Effekte von zwei Krafttrainingsmethoden als spezifische Trainingsintervention bei Patienten mit Diabetes mellitus Typ2 – Hypertrophiekrafttraining versus Kraftausdauertraining (2012). Diabetologie und Stoffwechsel 2012;7:128

- **Strength training at least 3 times per week with low intensity to improve the glycemic metabolism.**
    - Halle M, Kemmer FW, Stumvoll M, Thurm U, Zimmer P: Körperliche Aktivität und Diabetes Mellitus. (2008) 1-37. Deutsche Diabetes Gesellschaft. Evidenzbasierte Leitlinie der Deutschen Diabetes Gesellschaft.

REHA FIT

Goal: Training escpecially with orthopedic complaints and to regain physical capacity.

- **Isocinetic training is especially suitable for orthopaedic problems and for strength improvement.**
    - Gur, H.; Cakun, N.; Akova, N.; Okay, E.; Kucukoglu, S. (2002). Concentric versus combined concentric – eccentric isokinetic training: effects on functional capacity and symptoms in patients with osteoarthrosis of the knee. *Archive of Physical Medicine and Rehabilitation*, Vol.83(3), p.308–316. http://www.archives-pmr.org/article/S0003-9993(02)69160-9/abstract

- Golik-Peric, D.; Drapsin, M.; Obradovic, B.; Drid, P. (2011). Short-Term Isokinetic Training Versus Isotonic Training: Effects on Asymmetry in Strength of Thigh Muscles. *J Hum Kinet*, Vol.30, p.29–35. http://www.ncbi.nlm.nih.gov/pubmed/23486358
- Pipes, T.V. and Wilmore, J.H. (1975). Isokinetic vs isotonic strength training in adult men. *Medicine & Science in Sports*, Vol.7(4), p.262-274. http://www.ncbi.nlm.nih.gov/pubmed/1235149

- **Improvement of performance and decreased risk of injury through negative training method to regain a normal performance level.**

  - Lindstedt, S.L.; LaStayo, P.C.; Reich, T.E. (2001). When Active Muscles Lengthen: Properties and Consequences of Eccentric Contractions. *Physiology*, Vol.16(6), p.256-261. http://physiologyonline.physiology.org/content/16/6/256
  - Schache, A. (2012). Eccentric hamstring muscle training can prevent hamstring injuries in soccer players. *J Physiother*, Vol.58(1), p.58. http://www.ncbi.nlm.nih.gov/pubmed/22341384

PERIODIZATION

Periodized training programs double the training efficiency

Every six training sessions the training method will change and set a new stimulus. EGYM thus sets on a form of undulating periodization combined with practical considerations not to confuse the user (especially older people) by changing the training style to often.

GENERAL PERIODIZATION STRUCTURE

1. **Phase: PREPARATION**
   The trainee is prepared for the upcoming main phase

2. **Phase: TARGET**
   The most effective training goal method (primary method) is selected

3. **Phase: VARIATION**
   Variation of parameters to enhance effect of primary goal and add other functionality (secondary method)

4. **Phase: RE-TARGET**
   Coming back to the primary method

- **Periodized training is about twice as effective as non-periodized training.**
  - Fleck, S.J. (1999). Periodized Strength Training: A Critical Review. *Journal of Strength and Conditioning Research*, Vol.13(1), p.82–89. http://journals.lww.com/nsca-jscr/Abstract/1999/02000/Periodized_Strength_Training__A_Critical_Review_.15.aspx

- **Undulated vs. linear periodization to enhance the effect**
  - Peterson, M.D.; Dodd, D.J.; Alvar, B.A.; Rhea, M.R.; Favre, M. (2008). Undulation training for development of hierarchical fitness and improved firefighter job performance. *J Strength Cond Res*, Vol.22(5), p.1683-1695. http://www.ncbi.nlm.nih.gov/pubmed/18714214

- **Periodization to prevent overtraining.**
  - Fleck, S. and Kraemer, W. (2014). Designing Resistance Training Programs. ISBN-13: 9780736081702. http://www.humankinetics.com/products/all-products/Designing-Resistance-Training-Programs-4th-Edition

MUSCLE GAIN

1. PREP: “Robustness” (*Negative Training)*
   Enhanced-eccentric training with moderate load
   → Add strength and micro-muscle damage to make muscles more robust against injuries in the high-intensity training phases following.
2. TARGET: “Muscle Gain” (*Adaptive Training)*
   Training past muscle failure with high loads
   → Create metabolic stress and mechanical tension to stimulate muscle growth.
3. VARIATION: “Maximum Strength” (*Isokinetic Training)*
   Low rep intervals with eccentric overload
   → Creation of maximal mechanical tension and muscle damage to stimulate muscle growth.
4. TARGET: “Muscle Gain” (*Adaptive Training)*
   Training past muscle failure with higher loads
   → Create metabolic stress and mechanical tension to stimulate muscle growth.

LOSE WEIGHT

1. PREP: “Endurance” (*Regular Training)*
   Concentric-eccentric high-speed and high volume training with low loads
   → Primary improving muscle supply and economization of the cardiovascular system. Secondary increasing muscle power endurance.
2. TARGET: “Fat Burn” (*Isokinetic Training)*
   Concentric-focused high-intensity volume training
   → Burning calories and increasing muscle power.
3. VARIATION: “Muscle Gain” (*Adaptive Training)*
   Training past muscle failure with moderate loads
   → Create metabolic stress to stimulate muscle growth.
4. TARGET: “Fat Burn” (*Isokinetic Training)*
   Concentric-focused high-intensity volume training
   → Primary burning calories and secondary increasing power endurance.

GENERAL FITNESS

1. PREP: “Endurance” (*Regular Training)*
   Concentric-eccentric high-speed training with moderate loads
   → Improve economization of the cardiovascular system, muscle supply and power endurance.
2. TARGET: “Muscle Gain” (*Adaptive Training)*
   Training past muscle failure with moderate load
   → Progress intensity, add strength and create metabolic stress to stimulate muscle growth.
3. VARIATION: “Robustness” (*Negative Training)*
   Enhanced-eccentric training with moderate load
   → Add strength and coordination to make muscles more robust against injuries.
4. TARGET: “Muscle Power” *(Explonic Training)*
   Low weight - maximum velocity training for power output.
   → Translate the muscle strength to power output for performance increases.

ATHLETIC

1. PREP: “Robustness” (*Negative Training)*
   Enhanced-eccentric training with high load
   → Add strength, muscle damage and coordination to make muscles more robust against injuries.
2. TARGET: “Power” *(Explonic Training)*
   Low weight - maximum velocity training for power output.
   → Translate the muscle strength to power output for performance increases.
3. VARIATION: “Muscle Gain” (*Isokinetic Training)*
   Intense training load with moderate intensity
   → Increase muscle growth and endurance improvement.
4. RE-TARGET: “Power” *(Explonic Training)*
   Low weight - maximum velocity training for power output.
   → Translate the muscle strength to power output for performance increases.

BODY SHAPING

1. PREP: “Endurance” (*Negative Training)*

Enhanced-eccentric high-speed training with low load
→ Primary improve muscle supply, coordination and gently create muscle damage to stimulate muscle growth.

2. TARGET: “Fat Burn” (*Isokinetic Training)*
   Intensive high-volume descending pyramid training
   → Burning calories and create metabolic stress to stimulate muscle growth.
3. VARIATION: “Muscle Gain” (*Adaptive Training)*
   Training past muscle failure with high load
   → Create metabolic stress and mechanical tension to stimulate muscle growth.
4. RE-TARGET: “Fat Burn” (*Isokinetic Training)*
   Intensive high-volume descending pyramid training
   → Burning calories and create metabolic stress to stimulate muscle growth.

METABOLIC FIT

2. PREP: “Activation” (*Negative Training)*
   Enhanced-eccentric training for lower increase in systolic blood pressure.
   → Economization of the cardiovascular system.
3. TARGET: “Metabolism” (*Regular Training)*
   Low Intensity and high count of repetitions.
   → Muscular endurance training to stimulate the metabolism.
4. VARIATION: “Fat Burn” (*Negative Training)*
   Enhanced-eccentric training with many repetitions.
   → Enhanced fat burn effect.
5. RE-TARGET: “Muscle Growth” (*Regular Training)*
   Short intense sets to activate the cardiovascular system in the concentric
   → Stimulate muscle-growth.

1e)

CONTROL OF TRAINING PARAMETERS

The live-feedback through the device display controls the crucial training parameters and therefore improves the efficiency.

The crucial training parameters which are necessary for a differentiated resistance training are controlled by live-feedback on the device display: Range of Motion (RoM), Time under Tension (TuT), Repetitions, Sets, Rest Time, Cadence, Weight, Level of Muscle Loading (muscle failure) and Exhaustion.

- **Crucial parameters are controlled: Time under Tension (TUT), Resting Time, Intensity, Repetitions, Speed of movement, Range of Motion (ROM)**
  - Toigo, M. and U. Boutellier (2006). New fundamental resistance exercise determinants of molecular and cellular muscle adaptations. *Eur J Appl Physiol,* Vol.97(6), p.643-663. http://link.springer.com/article/10.1007/s00421-006-0238-1

- **Higher effect of controlled training.**
  - Huberty, J.L.; Ransdell, L.B.; Sidman, C.; Flohr, J.A.; Shultz, B.; Grosshans, O.; Durrant, L. (2008). Explaining long-term exercise adherence in women who complete a structured exercise program. *Res Q Exerc Sport*., Sep, Vol.79(3), p.374-84. http://www.tandfonline.com/doi/abs/10.1080/02701367.2008.10599501#.VGSo9fmG-Ps

1f)

JOINT ANGLE DEPENDENT RESISTANCE

An optimal muscle load is achieved through joint angle dependent resistance.
In all EGYM devices the training resistance is adjusted in the background to the exercise specific force-joint angle-relation. Thus, the user is able to exercise in a greater range of motion, achieves a continuous muscle load and finally experiences a greater training success.

- **Greater effect in older people.**
  - Walker, S.; Peltonen, H.; Sautel, J.; Scaramella, C.; Kraemer, W.J.; Avela, J.; Häkkinen, K. (2014). Neuromuscular Adaptations to Constant vs. Variable Resistance Training in Older Men. *International Journal of Sports Medicine*, Vol.35(1), p.69-74. http://www.ncbi.nlm.nih.gov/pubmed/23825004

- **Greater improvement of strength endurance.**
  - Walker, S.; Hulmi, J.J.; Wernbom, M.; Nyman, K.; Kraemer, W.J.; Ahtiainen, J.P.; Häkkinen, K. (2013). Variable resistance training promotes greater fatigue resistance but not hypertrophy versus constant resistance training. *European Journal of Applied Physiology*, Vol.113(9), p.2233-2244. http://www.ncbi.nlm.nih.gov/pubmed/23636698

USER FRIENDLINESS

2a)

USER RECOGNITION

The automatic user recognition leads to more safety and comfort.

The individual device settings which were customized once by the coach are retrieved and adjusted within seconds when the user is recognized by the device. This way a wrong usage of the strength training device is almost eliminated.

- **Injury risks are minimized while training comfort is increased.**
  - Haff, G.G. (2000). Roundtable discussion: Machines versus free weights. *Strength & Conditioning Journal*, Vol.22(6), p.18-30. http://journals.lww.com/nsca-scj/Citation/2000/12000/Roundtable_Discussion__Machines_Versus_Free.4.aspx

- **The training quality is enhanced by a controlled training.**
  - Toigo, M. and U. Boutellier (2006). New fundamental resistance exercise determinants of molecular and cellular muscle adaptations. *Eur J Appl Physiol,* Vol.97(6), p.643-663. http://www.ncbi.nlm.nih.gov/pubmed/16845551
  - Fleck, S. and Kraemer, W. (2014). Designing Resistance Training Programs. ISBN-13: 9780736081702. http://www.humankinetics.com/products/all-products/Designing-Resistance-Training-Programs-4th-Edition

- **Customers feel safe, well guided and therefore visit the gym with pleasure.**
  - Trost, S.G.; Owen, N.; Bauman, A.E.; Sallis, J.F.; Brown, W. (2002). Correlates of adults' participation in physical activity: Review and update. *Medicine & Science in Sports & Exercise*, Vol.34(12), p.1996–2001. http://www.ncbi.nlm.nih.gov/pubmed/12471307

2b)

AUTOMATIC TRAINING DATA TRACKING & ANALYSIS

The automatic training data tracking and analysis improve the training and support quality.

The training data of the EGYM devices are available for coaches and customers without additional effort. Free exercises have to be documented manually. General rule: The more information a coach has about his customer the better he can take care of him. The training data analysis (e.g. muscle imbalances) delivers qualitative statements about the training condition.

- **About three-quarters of adopters reported that using a "Electronic Health Care Record" (EHR) system resulted in enhanced patient care**
  Jamoom, E.; Beatty, P.; Bercovitz, A.; et al. (2012). Physician adoption of electronic health record systems, United States, 2011. NCHS data brief, No 98. Hyattsville, MD: National Center for Health Statistics.
  http://www.cdc.gov/nchs/data/databriefs/db98.htm

- **Individual customer informations help trainers to design better training programs**
  - Kraemer, W.J. and Ratamess, N.A. (2004). Fundamentals of resistance training: progression and exercise prescription. *Med Sci Sports Exerc,* Vol.36(4), p.674-688. http://www.portalsaudebrasil.com/artigospsb/ativfis025.pdf
  - Fleck, S. and Kraemer, W. (2014). Designing Resistance Training Programs. ISBN-13: 9780736081702. http://www.humankinetics.com/products/all-products/Designing-Resistance-Training-Programs-4th-Edition

2c)

INTENSE INTERACTION

The intense interaction through live-feedback with the device display promotes the self-control.

- **Higher effect of controlled training.**
  Huberty, J.L.; Ransdell, L.B.; Sidman, C.; Flohr, J.A.; Shultz, B.; Grosshans, O.; Durrant, L. (2008). Explaining long-term exercise adherence in women who complete a structured exercise program. *Res Q Exerc Sport*., Sep, Vol.79(3), p.374-84.
  http://www.tandfonline.com/doi/abs/10.1080/02701367.2008.10599501#.VGSo9fmG-Ps

2d)

AUTOMATIC ADJUSTMENT TO THE TRAINING SUCCESS

The training weight and method are automatically adjusted to the user's training success.

The training program of the EGYM training devices is automatically adjusted to the routinely conducted isometric

- **Periodized training is twice as effective as non-periodized training**
  - Fleck, S.J. (1999). Periodized Strength Training: A Critical Review. *Journal of Strength and Conditioning Research*, Vol.13(1), p.82–89. http://www.readcube.com/articles/10.1097/00124278-199902000-00015

- **Variety of training increases training adherence and enjoyment of training**
  - Juvancic-Heltzel, J.A.; Glickman, E.L.; Barkley, J.E. (2013). The effect of variety on physical activity: a cross-sectional study. J*ournal of Strength and Conditioning Research*, Vol.27(1), p.244-51. http://www.ncbi.nlm.nih.gov/pubmed/22395266
  - Glaros, N.M., Janelle, C. M. (2001). Varying the mode of cardiovascular exercise to increase adherence. Journal of Sport Behavior, Vol.24(1), pp.42-62. http://www.biomedsearch.com/article/Varying-Mode-Cardiovascular-Exercise-to/70935200.html

MEMBER MOTIVATION AND LOYALTY

3a)

Social Support

Social Supports facilitates goal attainment.

EGYM users are connected through the EGYM platform (web, mobiles app) and can share and compare their training success with friends.

- **Social support is essential for long-term motivation**
  - Trost, S.G.; Owen, N.; Bauman, A.E.; Sallis, J.F.; Brown, W. (2002). Correlates of adults' participation in physical activity: Review and update. *Medicine & Science in Sports & Exercise*, Vol.34(12), p.1996–2001. http://www.ncbi.nlm.nih.gov/pubmed/12471307

3b)

TRAINING FREQUENCY

A structured training program leads to more frequent training and therefore to an effective training

The EGYM training program delivers all important training parameters and is separated in several phases which function as progress goals.

- **Training frequency & motivation is higher with a structured training schedule**
  - Seguin, R.A.; Economos, C.D.; Palombo, R.; Hyatt, R.; Kuder. J.; Nelson, M.E. (2010). Strength training and older women: a cross-sectional study examining factors related to exercise adherence. *J Aging Phys Act*, Vol.18(2), p.201-18. http://www.ncbi.nlm.nih.gov/pubmed/20440031
  - Trost, S.G.; Owen, N.; Bauman, A.E.; Sallis, J.F.; Brown, W. (2002). Correlates of adults' participation in physical activity: Review and update. *Medicine & Science in Sports & Exercise*, Vol.34(12), p.1996–2001. http://www.ncbi.nlm.nih.gov/pubmed/12471307

- **Focus on progress goals improves motivation more than pursuing an outcome goal**
  - Wilson, K.; Brookfield, D. (2009). Effect of Goal Setting on Motivation and Adherence in a Six-Week Exercise Program. *International Journal of Sport and Exercise Psychology*, Vol.7(1), p.89-100. http://www.cabdirect.org/abstracts/20103007078.html;jsessionid=C56B2C7CF0818DCE2997C7C1E283ED6D
  -

3c)

TRAINING SUCCESS

Training success motivates training program retention and reduces churn.
At EGYM maximum force measurements are periodically conducted and all training data are recorded. The training data and training success evaluation are presented regularly to the customer and can always be accessed online.

- **Long-term motivation is only achieved with a purposeful record and presentation of the training success.**
  - Trost, S.G.; Owen, N.; Bauman, A.E.; Sallis, J.F.; Brown, W. (2002). Correlates of adults' participation in physical activity: Review and update. *Medicine & Science in Sports & Exercise*, Vol.34(12), p.1996–2001. http://www.ncbi.nlm.nih.gov/pubmed/12471307