

Frontiers of Motivation Research on Feedback
Interdisciplinary Insights from Neurology and Cardiology

Master of Science Thesis
Submission: Vallendar, June 23, 2020

First Supervisor: Asst. Prof. Dr. Daniel Schaupp
Second Supervisor: Prof. Dr. Utz Schäffer

Institute of Management Accounting and Control

WHU – Otto Beisheim School of Management

Jan Eric Walsken

“All our provisional ideas in psychology will presumably someday be based on an organic substructure.”

S. Freud, “On Narcissism” (1914), S.E. 14: 73–102. (London: Hogarth Press)

“We know nothing about motivation. All we can do is write books about it.”

Drucker, P. F. (1969). *The age of discontinuity: Guidelines to our changing society*. New York, NY: Harper and Row.

***“If you ever get close to a human
And human behavior
Be ready, be ready to get confused***

***There's definitely, definitely, definitely no logic
To human behavior
But yet so, yet so irresistible***

And there's no map

***They're terribly, terribly, terribly moody
Oh, human behavior
Then all of a sudden turn happy***

***But, oh, to get involved in the exchange
Of human emotions
Is ever so, ever so satisfying”***

Hooper, N, & Björk, (1993). *Human behavior*. On Debut. London: One Little Indian, & Elektra

Abstract

Research on motivation may be alive and vital, but it is highly fragmented. This thesis discusses the most prevalent motivation theories and compares their ideas and concepts to introduce two new fields of research in this area: neurology and cardiology. The next era of motivation research will conflate concepts derived from behavioral approaches with organic substructure and elevate our understanding of motivation. A sound understanding of motivation allows organizational scholars to solve the motivational problem in the context of the organizational problem. To make proper use of promising novel insights in organizational contexts, we will revisit the current state of performance evaluation and their ability to coordinate and motivate individuals. By reconsidering how rewards crowd out intrinsic motivation via complex moods, and how superior intrinsic motivation increases performance compared to extrinsic motivation, this thesis introduces the motivation-potential model of feedback. Using a case study on a feedback-based management control system at a European e-commerce company based in Germany, we test how self-determination theory could be expanded by neurological concepts and quantitatively applied to design performance evaluation systems under the consideration of the motivation-potential model of feedback. In its entirety, this thesis attempts to build common ground for the future of motivation research and provides in-depth examples of theorization upon the aggregation of the field of research, as well as practical application and execution.

TABLE OF CONTENTS

List of Figures	VIII
List of Tables	IX
1. Introduction.....	1
2. Review of Process- and Drive-Based Motivation Theories.....	2
2.1 Motivation in Ancient Greek Philosophy	3
2.2 Psychoanalysis and Motivation (about 1900 to 1930).....	5
2.3 Drive-Reduction Theory (about 1930 to 1960)	6
2.4 The Law of Effect (1898)	8
2.5 Respondent Conditioning (1897).....	9
2.5.1 Acquisition.....	10
2.5.2 Extinction and Recovery.....	10
2.5.3 External Inhibition and Disinhibition	10
2.5.4 Stimulus Generalization and Discrimination.....	11
2.5.5 100 Years Later: Excursion on The-Little-Albert-Experiment.....	11
2.5.6 Number of Repetitions and Intervals	12
2.6 Operant Conditioning (1938).....	12
2.6.1 Reinforcement, Punishment, and Extinction	13
2.6.2 Influencers of Reinforcement Effectiveness.....	14
2.6.3 Application in Economics.....	15
2.7 Field Theory (1936).....	15
2.8 Social Learning Theory (1960).....	17
2.9 Achievement Motivation (1964).....	18
2.10 Attribution Theory (1958)	20
2.11 Effectance Motivation (1959).....	22
2.12 Effectance Motivation Reconsidered (1978)	23
2.13 Optimal Incongruity (1965).....	24
2.14 Goal-Setting Theory (1984).....	25

2.15 Flow Theory (1979-present)	26
2.16 Personal Causation (1968)	28
2.17 Feedback Intervention Theory (1996)	28
2.18 Discussion	30
2.19 Conclusion	31
3. Self-Determination Theory (1975 to present).....	31
3.1 The Six Mini-Theories	32
3.1.1 Cognitive Evaluation Theory (CET).....	32
3.1.2 Organismic Integration Theory (OIT)	34
3.1.3 Causality Orientations Theory (COT)	35
3.1.4 Basic Psychological Needs Theory (BPNT).....	36
3.1.5 Goal Contents Theory (GCT)	36
3.1.6 Relationship Motivation Theory (RMT).....	37
3.2 Application of Self-Determination Theory in Work Organizations	38
3.3 Self-Determination Theory and Feedback	40
3.4 Self-Determination Theory and Incentives	44
3.5 Self-determination Theory and Thriving	45
3.6 Discussion	46
3.7 Conclusion	47
4. Neuroscience and Motivation	48
4.1 Terminologies and Concepts.....	48
4.1.1 Neuroscience and Motivation: How Neuroscience Informs on Motivation ..	49
4.1.2 Measuring Brain Activity	50
4.1.3 Brain Areas Relevant for Motivation research	50
4.2 Synthesis of Concepts in Motivation Research and Neurology	52
4.2.1 Goal-Oriented and Influencers of Expectancy	53
4.2.2 Agency	55
3.2.3 Expectancy	57

4.2.4 Self-efficacy	58
4.2.5 Intrinsic Motivation	58
4.2.6 Extrinsic Motivation	59
4.2.7 Intermediary Conclusion.....	59
4.3 Novel Perspectives on Task Difficulty, Effort, and Motivation Potential.....	61
4.3.1 Moods and Motivation Potential.....	62
4.3.2 Complex Moods Determine Effort Via Expectancy	64
4.3.3 Novel Perspectives on the Undermining Effect.....	66
4.4 Performance-Contingent Monetary Incentives	70
4.5 Energetic Arousal and the Undermining Effect.....	71
4.5.1 The Undermining Effect and Practice	73
4.6 Discussion.....	75
4.7 Conclusion	75
5. Feedback	76
5.1 Development of Feedback in Business Organizations.....	77
5.2 Status-Quo of Feedback in Work Organizations	79
5.3 Toward Feedback as a Coordination and Motivation Instrument.....	83
5.3.1 Coordination Instrumentality	83
5.3.2 Motivation Instrumentality	84
5.3.3 Optimally Motivating Feedback	84
5.3.4 Ranking- and Scale-Based Feedback.....	85
5.3.5 Evaluative, Comparative, and Descriptive Feedback	86
5.3.6 Negative Feedback.....	87
5.3.7 Feedback Interventions	89
5.3.8 Priming and the Feedback-Sequence	92
5.3.9 The Time-Component of Receiving Feedback	94
5.4 Discussion and Conclusion.....	96
6. The Motivation-Potential Model of Feedback (MPMF).....	97

6.1 Coordination Instruments for Optimally Directed Energy	99
6.2 Motivation Instruments for Optimal Arousal	100
6.2.1 Definition of Output and Process.....	101
6.2.2 Assessment of Intrinsic Job Value.....	101
6.2.3 Extrinsic and Intrinsic Aspirations	103
6.3. Optimal Types of Feedback: Precise Definition of Output or Process.....	104
6.3.1 High Intrinsic Job Value	104
6.3.2 Low-Middle Intrinsic Job Value.....	104
6.3.3 No Intrinsic Job Value	105
6.4 Optimal Types of Feedback: Varying Definition of Output or Process	105
6.4.1 High Intrinsic Job Value	105
6.4.2 Low-Middle Intrinsic Job Value.....	105
6.4.3 Low Intrinsic Job Value.....	106
6.5 Practical Implications	106
7. Case Study: The Feedback System at X	109
8. Conclusion	110
8.1 Managerial Implications	110
8.2 Limitations	111
8.3 Suggestions for Future Research	111
References.....	113
Appendix.....	154

LIST OF FIGURES

Figure 1 White's Basic Model of Effectance Motivation as Presented in Harter (1978).....	23
Figure 2 Relationship of Pleasure and Task Difficulty (cf. Harter (1974, 1977, 1978))	24
Figure 3 Interrelations of Motivation Theories	30
Figure 4 Development of Self-Determination Theory	32
Figure 5 Taxonomy of Tangible-Contingent Rewards (Ryan, Mims, & Koestner, 1983).....	33
Figure 6 Extrinsic Motivation	34
Figure 7 Crowding-Out (Deci, Koestner, and Ryan (1999), Klein & Walsken (2018))	41
Figure 8 Corpus of Motivation Terms Adapted from Murphy and Alexander (2000)	53
Figure 9 Conceptual Comparison of Motivation Research and Neuroscience on Motivation.	60
Figure 10 Optimal Degree of Effort for Benefit, (cf. Gendolla & Richter (2010)).....	61
Figure 11 Motivation Potential Derived from Complex Moods	65
Figure 12 Derivation of Motivation Potential Through Complex Moods	66
Figure 13 Impact of an Increase in Arousal on Motivation Potential	72
Figure 14 Illustrative Trade-Off Between Specialization and Transaction Cost	79
Figure 15 Chronological Classification of Feedback Systems.....	82
Figure 16 Areas of Feedback with Respective Instrumentality for Value Maximization.....	83
Figure 17 Feedback-System Design with Interorganizational Interdependencies	97
Figure 18 Design of Motivation-Potential Maximizing Feedback-Systems	98
Figure 19 Segmentation of Expected Intrinsic Job Value.....	102
Figure 20 Differentiation According to Individual Aspirations.....	103
Figure 21 Examples of Comparative Feedback	106
Figure 22 Examples of Evaluative Feedback.....	107

LIST OF TABLES

Table 1 Overview of Brain Structures, Their Motivational Relevant Functions, and Circuits	52
Table 2 Complex Moods Derived from Biopsychological Dimensions (cf. Thayer (2001))....	63
Table 3 Examples of Feedback Differentiated by Content and Time of Reference	82

1. INTRODUCTION

Research on motivation is always connected to research on behavior, and why individuals act the way they do (Gollwitzer & Oettingen, 2015). The fascination with finding answers to why we do what we do dates several centuries back in time: the Greek philosophers were among the first to codify their thoughts and knowledge on human motivation (Dilts, 1998). Present-day researchers face a plentitude of motivation theories, challenging scientific progress, and (dogmatically) dividing the field of motivation research. With the emergence of novel research methods, neurologists and cardiologists are the next group of academics to join the discussion on the development and functioning of motivation. This thesis aims to create a common understanding of motivation by discussing, unifying, and synthesizing existing theories, which enables the effective incorporation of new findings. We will discuss self-determination theory as an overarching motivational framework, and briefly introduce and discuss concepts and terminologies from neurological motivation research. As theorization and practicability stand at the core of management research, we will focus on applying motivation theory as a key tool for performance optimization in organizations. To guide the discourse, we will revisit and define the purpose of feedback in organizations, and use these insights to develop a model of feedback that focuses on optimizing its motivation instrumentality. Finally, we will apply these insights to a case study about the application of feedback-tools.

This thesis contributes (1) to the field of motivation research by building the path for a common ground for terminology and applied frameworks, (2) to the field of management and accounting research regarding the use of management control systems for performance analysis, and (3) to the practical execution of motivation-optimizing feedback systems in work organizations.

We begin the thesis with a review of frequently re-discussed theories of motivation that have significantly shaped the course of research to date. This discussion results in the analysis and stepwise explanation of self-determination theory (Ryan & Deci, 2017), a sophisticated framework on motivation theory. Afterward, we will introduce the current state of neurological and cardiological research on motivation by discussing the motivation-related brain regions, as well as novel advances on the long-existing discussion regarding the crowding-out effect.

The course of this thesis is designed to provide an overview from theorization to practical application, to demonstrate that the research field, while approaching from different perspectives, indeed shares concepts while using different labels, and the insights could potentially elevate the motivation of employees in modern work organizations. Furthermore, as

neurologists (e.g., Murayama, Matsumoto, Izuma, and Matsumoto (2010)) are approaching motivation theory, current motivation researchers should be inspired to approach neurology and novel research methods to provide further progress in the research area. After reviewing and reflecting upon the history of motivation theories, we will discuss which present-day frameworks are most promising and useful for the near future. To bridge the gap between motivation theory and its application in work organizations, we will discuss feedback as a performance evaluation tool, reflect upon its theoretical framework, and develop a confluence of feedback as a motivation-optimizing tool in organizations to solve the organizational problem.

The review of need-based motivation theory bases on a review of literature and serves the refinement of motivation research. The exploration of feedback as a performance evaluation tool consists of a review of practical application and academic publications. The development of a motivation-optimizing framework on motivation bases on the insights from motivation and economic theory, while the case study uses qualitative analysis of an internal survey to test hypotheses.

The range of content of this thesis is broad and combines three critical topics as well as various scientific approaches and methodologies. For this reason, a separate discussion and conclusion follow each chapter, when suitable. This approach enables the reader to criticize and reflect on distinct sections without having to reject the overall conclusion of this thesis.

2. REVIEW OF PROCESS- AND DRIVE-BASED MOTIVATION THEORIES

Starting with the approaches towards motivation of Freud, this thesis focusses on cognitive motivational theories. Klein and Walsken (2018) discussed several need-based theories; however, none of these were able to make a long-lasting impact on motivation research.

Maslow's hierarchy of needs (1943), while being fashionable and widely spread outside of academia in all sorts of introducing literature on motivation in work organizations (Abulof, 2017), lacks an empirical foundation: the entire concept bases on the biographies of eighteen "successful" people (Maslow, 1970). While a study by Taormina and Gao (2013) with 386

participants found positive correlations among the stages of the hierarchy, i.e., the satisfaction of a lower-level need predicted satisfaction of the next higher-level need, a study with 60,865 participants from 123 countries, conducted by Tay and Diener (2011) found that fulfillment of the basic and safety needs is contingent on the home country. Multiple studies discuss for and against the satisfaction-progression hypothesis (also: *need-progression hypothesis*) (Jost, 2008, p. 22). At the same time, in one of his unpublished papers, Maslow engages with the discussion and argues that individuals may strive for a higher need while lacking a lower one, and no need ever fully dissolves but just becomes less important (Maslow, 1996). In conclusion, the simplistic incremental theory of need-progression is misleading and not auxiliary for the understanding of motivation.

The problem of small sample size and arbitrary methodology also applies to Herzberg's two-factor model (Herzberg, Mausner, & Snyderman, 1959). Locke and Latham (2019) declared Herzberg being a paragon of premature theorizing, and Schneider and Locke argued that the theory would confuse events and agents in its analysis (1971). Following his empirical research on employee needs, Alderfer formulated ERG-theory, which overlaps with Maslow but just notes three categories of needs (existence, relatedness, growth) (Jost, 2008, pp. 25-27). Even though ERG-theory drew inspiration from empirical research, the theory itself is not widely empirically tested. Nevertheless, Alderfer found more support for his theory than Maslow's, or the need-progression-hypothesis (1969).

Therefore, need-based motivation theories are excluded from the discussion in this thesis, and the focus lies on process- or content-based theories of motivation, which usually provide a more solid scientific foundation.

2.1 MOTIVATION IN ANCIENT GREEK PHILOSOPHY

One of the earliest examples of the conceptualization of motivation stems from Greek polymath Aristotle in an attempt to investigate causality in the world (Falcon, 2019). In *Physics*¹, he asserts that real knowledge of a cause could only be achieved by understanding its “why” – which he understands as its cause and as an indispensable resource for the student of nature. We can understand the why through the four causes, as described in *Physics* II 3 and *Metaphysics* V 2: the material (*hyle*) cause, formal (*eidos*) cause, efficient (*kinoun*) cause, and end (*telos*) cause. The material cause explains the “that out of which,” meaning material in its potential or raw form, the formal cause the designed shape, the efficient cause the object or

¹ *Physics*, 194 b 17-20

person which causes the change, and the end (or final) cause, the sake of which a thing is done (*Physics*, II.3. 194).

The material, formal, and efficient causes are feeding into the end cause, therefore is Aristotle's explanation teleological, i.e., referencing the end (*telos*) of the process. Here, the explanation of an outcome has priority in its analysis over the initiation of the process. Not everything that has come to an end in its natural process is *telos* – its goodness derives the causal end. This explanation provides an agent (efficient cause) as part of the process who must be interested in the end cause. While the four causes stand in the context of Aristotle's science of nature, he also uses them to explain human behavior, as well as artistry (Falcon, 2019).

Others argue that in *On the Soul* III 10, Aristotle describes motivation by examining the "sources of movement", which he depicts to be "mind" and "appetite" (Dilts, 1998). According to Plato's *The Republic*, appetite is the part of the soul which invokes desires in people. The appetite, like food, for example, is relative to an end as it stimulates hunger. Au contraire, the mind would not produce movement without the imagination or calculated thought of an appetite, hence creating anticipation or an expectation of the result of movement. Not always is appetite based on biological function, indeed, "wish", a desire which we believe will be useful to us is a form of appetite.

Thinking that just appetite is a source of motivation for movement would be short-sighted. Indeed, it would fail to explain why people, and even animals, develop individual preferences, at least up until this point. The Aristotelian theory that motivation is a confluence of mind and appetite (or reason and desire) stands at the end of Socratic rationalism and Plato's *Republic* theory (Cooper, 1984). In *The Republic*, Plato derives the three parts of the soul: reason, spirit, and appetite. Indeed, Plato is not dividing sources of motivation into two (appetite and spirit where the latter motivates the individual's temper in the presence of injustice), while only one represents a source of information, but explains that with every part of the soul there exists one kind of its own pleasure. The importance of the tripartition of the soul and coupling to respective pleasures becomes evident when an individual is in a situation where different parts might act at the same time. A thirsty individual would refrain from following its appetite when it knows that the liquid is hazardous: reason and appetite are conflicting, with reason being the stronger part of the soul – therefore, we do not drink gasoline when being thirsty.

As explained in the last paragraph, one of the three parts of the soul is spirit. Indeed, the translation of spirit is ambiguous, while the original Greek word θυμοειδής literally translates

to “*fume*”. Cooper (1984) argues that several passages of Platos Book IV, VIII, and examples in Book IX suggest that competitiveness and the desire for esteem and self-esteem are a better explanation of what is meant by spirit rather than tamper.

2.2 PSYCHOANALYSIS AND MOTIVATION (ABOUT 1900 TO 1930)

The Greek philosophers and Freud have in common that they are attempting to explain complex human behavior with only a few but fundamental concepts (Weiner, 1986). The simplicity of those concepts is both their strength and weakness.

The three cornerstones of Freud’s motivational theory are (1) his theory of drive², (2) his model of personality, and (3) his model of thought and action. His theory of drive describes the source, object, and the target of drives, where the *ultimate* goal is to abolish the initial impulse. A modest example would be the sensation of hunger, which is an internal physical stimulus, or its source. Eating food, the object of the drive removes the physical stimulus – reaching the drive target and leading to new internal stimuli. Internal physical stimuli cannot be removed by other means than reaching the drive target, while one could avoid or remove external stimuli. Usually, the drive object is something external, yet, imagination can also be a means for reaching the object.

Freud bases his research on observations of his patients. For this reason, his theories are part of the clinical approaches of motivational theory (Gracheva, 2018), and he might, due to his profession, have applied his neurological findings to his concepts of psychic energy³ and his conception of psychological determinism. The latter states that any behavior, no matter if conscious or subconscious, has a root cause. This behavior includes, e.g., free associations, life patterns, dreams, or jokes.

Freud was keen to define a dualistic taxonomy of drives. His first concept is inspired by Darwin and from human creation: aggression (self-preserving drive) and sexuality (species-preserving drive). His second concept distinguishes by function: life instinct and death instinct (Freud, 1915). The latter shows a striking similarity to the concept of homeostasis. According to Betts et al. (2017), homeostasis is the state of steady internal physical and chemical conditions maintained by living systems. This recent definition exemplifies how the term originates from medical research, also while initially being coined by Claude Bernard, a French

² Here, we follow the translation of the German word “*Trieb*”, for an elaborated discussion see Van Haute (2017)

³ According to Freud, psychic energy is the equivalent of physical energy, i.e., as lifting a box requires energy, so do psychological processes

medical doctor, in 1860 (Flechner, 1972). His other taxonomy of drives, life and death, is the ultimate goal of reaching homeostasis, i.e., returning to a resting state. We can compare this to the process of moving from arousal through a stimulus to its removal. Even though Freud later rejected this theory of life and death and settled with aggression and sexuality (or libido/Eros) (Freud, 1920), where sexuality shall not singularly mean genital sexuality, but general organ-based pleasure, as eating or smoking (Wallace, 2006).

At this point, one could assume that human behavior always is the result of trying to remove stimuli. However, Freud's personality model understood that reason and social and moral norms are regulators. Therefore, he introduced the concept of the three instances of human personality: the Id, the Ego, and the Super-ego (Freud, 1999). The Id contains basic instincts and drives, which are innate to human beings, the sexual and aggressive drives. The Super-ego represents conditioned and acquired moral beliefs and social rules in particular. We can see that the Id and Super-ego could easily interact in contradicting ways. For this reason, the Ego acts as an intermediary instance to moderate innate drives with social circumstances.

Based on his theory of drive, Freud asserts that the Id follows the principle of pleasure, and the Ego the principle of reality (Rudolph, 2007). Proceeding on that assumption, his model of thought and action includes the first model, where there is no mediating function between the Id and the Ego (unconscious activity), and the second model, where there is a mediating function (pre-conscious and conscious activity).

The three major Freudian principles unify to his motivational theory. In essence, psychic energy seeks to achieve a homeostatic state. Any drive causes psychic energy. At the beginning of life, a child follows the principle of pleasure and can satisfy any drive immediately, i.e., restore the homeostatic state after the drive caused arousal. Later, as the child becomes aware of social norms, the principle of reality does not allow immediate offsetting of the impulse. Instead, humans use generated psychic energy to achieve other goals – a concept Freud called “*sublimation*” (Schmale, 1995), which borrows from Nietzsche and Schopenhauer.

As Miró (1999) suggests, Freud's concept of motivation provides a fundamental contribution towards an explanation for psychic energy (or motivation) to work – it originates from tensions within the organism, which strive for relief.

2.3 DRIVE-REDUCTION THEORY (ABOUT 1930 TO 1960)

Clark L. Hull, a US-American psychologist, started ambitiously to develop a theory which was supposed to explain all kind of behavior in every organism (Dewey, 2017). Only about

thirty years after its development, researchers rejected his theories. As written in Bolles (1990): "*Hull would have been unable to read a present-day research paper; none of it would have made any sense!*". Nevertheless, his theory had a significant impact on motivation research (Kruglanski, Chernikova, & Kopetz, 2015).

The basic underlying principle of Hull's theory is homeostasis (Seward, 1956), a concept which is discussed in the chapter on motivation and psychoanalysis. Even though Bernard coined the term already in 1860, it was not until 1932 that it got much recognition thanks to physiologist Walter B. Cannon's publication "*The wisdom of the body*" (Cannon, 1932). Hull's and Freud's approaches are, therefore, rooted in the same biological principle and share several commonalities: to Hull, any behavior is a result of a biological requirement. The more explicit focus on biological causes is a precision of Freud's approach, which we can see on the example of hunger: to Freud, hunger itself is a form of appetite, and therefore a drive. However, Hull would argue from a biological point of view that hunger itself is not balanced with satiety, but rather the levels of glucose and fat in the body are imbalanced (Dewey, 2017). Due to the unpleasant nature of drives, one seeks to eliminate them, e.g., through eating or searching for food. While Freud claimed that a drive would cause psychic energy, which is required to eliminate the drive, Hull states that the drive itself is the energy that is required for elimination.

Both Freud and Hull maintained the point of view that drives are inherently unpleasant, but Hull expanded on that facet: he believed that once an organism found a way to eliminate a drive, the organism will repeat the behavior, once the drive occurs again, i.e., there are learning effects. Therefore, Hull's theory is called a *drive-reduction* theory, a part of learning theory: eliminating a drive reinforces particular behavior.

In an attempt to formalize the probability of a specific response (R) to a stimulus, Hull isolated drive (D) and habit (H) as intervening variables, i.e., $R = D * H$ (Funke, 2003). Hull only considers one single drive, what he calls the primal drive, while Freud, despite changing his opinion on which drives, consistently considered two. While the variable D can stand for different drives, the variable H is a moderator of the magnitude of the drive on the probability of the behavior. Here, it becomes evident why drive-reduction theory is also a learning theory: the stronger the stimulus-response-scheme, the larger the impact of H on D.

When the results of animal experimentation of US-American psychologist Leo P. Crespi showed that sudden shifts in responses to reinforcement would invoke disproportionate changes in performance (c.f. *Crespi effect* (American Psychological Association, 2018)), Hull expanded

his formula by the variable K for incentive. However, incentives were not the only missing variable which he added to his formula at later points. The ambition to explain all kinds of behavior in every organism, would, as one might expect, require several more adaptations and additions not only to his theory, but also its formularization. In collaboration with colleagues, Hull's final formula is $R = V * D * K * J * sHr - sIr - Ir - sOr - sLr$, where the delay before an organism can seek reinforcement (J), reactive fatigue (IR), conditioned inhibition caused by a lack of previous reinforcement (sIr), a reaction threshold (sLr), and random error (sOr) are accounted for (Hull, et al., 1940).

Looking at the formula and adaption for the Crespi-effect, one can see that advances in reinforcement theory, studied at roughly the same period, had an impressive impact on motivation research. A new principle of moderation of motivation became the subject of interest: incentivization.

2.4 THE LAW OF EFFECT (1898)

Psychologist Edward L. Thorndike formulated the Law of Effect in 1898. The principle states that consequences from behavior are influencing the probability of repetition of the behavior in the future when a stimulus S produced a response R with a satisfying state of affairs (Kyonka, 2011; Thorndike, 1898). Originally, Thorndike expanded his principle on proposing that if R is followed by a dissatisfying, or negative state of affairs, it will weaken the S-R association. He later revised the principle, calling the first approach the strong Law of Effect, and the later version the weak Law of Effect (American Psychological Association, 2018).

In the experimental setup of Thorndike's study, he captured a hungry cat inside of a box and measured the time it would take the cat to press a lever that would open the box and get to the food (Mazur, 2013). In the first attempts, the cat would use instinctual responses to escape the box, as scratching, digging, howling, or pushing the upper side of the box until pressing the lever would set the cat free. In repeating trials, the cat would require less and less time to press the lever. Thorndike concluded that pressing the lever and producing a pleasant state of affairs through freedom formed the S-R association, but also noted that the Law of Effect is context-specific: without a desire for freedom to eat, the cat would not want to escape the entrapment.

Just as the principle of homeostasis, another biological principle may have inspired the researcher in his work: In 1859, Charles Darwin published his research "*On the origin of species*" (Darwin, 1859), where he states that organisms with situationally fitted behavior are evolutionarily more successful. In Thorndike's experiment, the cat, which is the quickest to

escape the box, will have a relative advantage to those cats requiring more time or not escaping the box at all.

Colwill and Rescola (1985) conducted two experiments to investigate whether the S-R association decreases over time, finding that substituting a reinforcer with a new reinforcer would create new associations, and devaluing an extensively used reinforcer effectively reduces the response.

2.5 RESPONDENT CONDITIONING (1897)

In 1897, Russian physiologist Ivan Pavlov published the results of his experiments conducted on the digestions of canines (Pavlov, 1910; Coon & Mitterer, 2015). Using a setup designed to measure the digestive fluids of the animal outside of the body, he noticed that salivation increased in the presence of the technician in charge of feeding, and not just in the presence of food. From this observation, Pavlov designed an experimental setup, including a stimulus, presented before the feeding. He concluded that a stimulus could be coupled to the feeding, i.e., enforcing an association of the (unrelated) stimulus with the food. The focus of Pavlovian, respondent, or classical conditioning, lies in involuntary and automatic behaviors (Cherry & Gans, *The Difference Between the Classical and Operant Conditioning*, 2019) and the pairing of stimuli to elicit responses (Sparzo, 2019).

In the experiment, the dog food powder was the unconditioned stimulus (US), as it triggers an unlearned, i.e., natural response (UR). Another example of an UR is a stomach virus that triggers nausea (McLeod, 2018). The neutral stimulus (NS) was the sound of a metronome, which is naturally not causing canines to salivate. Now, by coupling the sound of the metronome to the feeding procedure, the sound becomes a conditioned stimulus (CS), as it links the canine's association with feeding. The UR of salivation in the presence of food becomes a conditioned response (CR) with the sounds of the metronome.

To summarize, the conditioning process involves three stages: we start with an unconditioned stimulus, which evokes an unconditioned response. During the conditioning, a neutral stimulus is paired with the unconditioned stimulus to evoke the unconditioned response again. The learning effect occurred more rapidly if the time interval between the CS and US was short (Brink, 2008), as we will discuss in 2.5.6 Number of Repetitions and Intervals.

While the denotation of the response might appear as if the unconditioned and conditioned response would be identical, there are several differences. Pavlov noted that the composition of the saliva was different between the UR and CR, which may be an indicator that the CR is a

different kind of response than the UR (Rescorla, 1988). Furthermore, the CR may be expressed weaker than the UR (Brink, 2008).

2.5.1 ACQUISITION

In his experiments, Pavlov repeated the conditioning process. Nevertheless, there appear to be CRs where repetition is not necessary, e.g., in fear conditioning, as researched in the Little-Albert-Experiment, conducted by Watson and Rayner (1920): a nine-month-old infant was shown several items, like live animals, masks, and a burning newspaper. The infant showed no fear towards these items but would indeed burst into tears when the scientists strike a metal bar with a hammer hung behind the infant's head. Two months later, the scientist would now strike the metal bar a few seconds after presenting a white rat to the infant and repeated the procedure seven times over seven weeks. Presenting the white rat to the infant without hitting the metal bar would now cause the infant to cry and crawl away. The experiment showed that respondent conditioning could also be applied to humans. So, the number of necessary repetitions may differ between CS-US pairings, while the speed of acquisition may depend on factors as previous experience and the motivational state, and decreases towards completion (Cherry & Gans, 2019).

2.5.2 EXTINCTION AND RECOVERY

If, over a more extended time, the CS is repeatedly presented without the US, the CS might stop evoking a CR, i.e., causing the extinction of the CR. The infant from the experiment showed a significantly weaker negative response to the white rat after already ten days. However, the extinction does not entirely eradicate the conditioning; repeating the CS-US pairing after extinction will take considerably less time than during the initial acquisition (Lavond, Steinmetz, Yokaitis, & Thompson, 1987). So can spontaneous recovery, where testing a CS after a rest period after extinction, will again evoke a (much weaker) CR, which can also occur by re-visiting the environment or re-evoking the US without the CS being present.

2.5.3 EXTERNAL INHIBITION AND DISINHIBITION

The process of acquisition may be prolonged or hindered through an external stimulus (ES) of distracting nature that is not part of the to be conditioned response (Wenger, 1936; Logan, 1999). The intensity of the ES, amount of time required to notice the ES, and how strict the control of the learning environment was (i.e., how different the ES is from the environment) have an impact on the extent of the ES. At the same time, introducing the ES after extinction can lead to the contrary result and increase the conditioned reaction. As researched by Wenger

(1936), re-conditioning a response with a different stimulus will show a relatively stronger reaction to the new than the initial stimulus.

2.5.4 STIMULUS GENERALIZATION AND DISCRIMINATION

The conditioned subjects may not only respond to identical stimuli but also related or somewhat similar versions. Re-visiting the poor infant from the experimental study of Watson and Rayner, it generalized the fear of the white rat and developed phobias of the family dog, a fur coat, cotton wool, and a mask of Father Christmas (McLeod, 2018). The CS can be bound to the US through discrimination, a conditioning process, using acquisition and extinction iteratively. If the subject reacts to the CS and no generalized stimuli, the discrimination process was successful. Pavlov observed that some of the canines showed signs of experimental neurosis when overwhelmed by the task complexity (Sparzo, 2019).

2.5.5 100 YEARS LATER: EXCURSION ON THE-LITTLE-ALBERT-EXPERIMENT

As the writing of this thesis takes place 100 years after the publication of the experiment of John B. Watson and his assistant Rosalie Rayner, we will dedicate this paragraph to discuss some aspects of it in more detail.

Watson and Rayner intended to condition a phobia in an infant which is otherwise emotionally stable, using the same procedures as in Pavlov's experimental study of the condition of dogs. While the results indicate the creation of a phobia, also through generalization, Watson and Rayner did not conduct any follow-up research on the infant at a later age. Researchers Beck and Irons (2011) assume in their publication "*Finding Little Albert*" that the infant most likely was a child to a foster mom and moved shortly after the termination of the experiment, not giving time for the extinction process.

Beck and Irons were indeed able to find one subject who may have been the infant from the experimental study and confirmed that the person developed a life-long phobia of dogs. Now, while the object used in the study was a white rat and Watson and Rayner were not able to ascertain that the phobia of the family dog is rooted in the experiment, one can argue that the results still lack validation, despite the follow-up of Beck and Irons.

The experiment was a source of inspiration and starting point in the fields of infant development, and the psychology of emotion (Watson, 1919). During the time of the conduction of the experiment, no formal ethics code was in place (Hobbs, 1948). Today, it would break the current American Psychological Association Ethical Principles of Psychologists and Code of Conduct in regarding the general principles of nonmaleficence, responsibility, and respect for

people's rights (American Psychological Association, 2017). While the involved live animals (a leashed monkey, a dog, a rabbit, and the white rat) only took a passive role in the experiments, at least the enclosure of the animals would be questionable today.

2.5.6 NUMBER OF REPETITIONS AND INTERVALS

In *forward conditioning*, the CS starts before the US to indicate that the CS will start (Chang, Stout, & Miller, 2004). It is the conditioning with the fastest learning success and occurs in two forms: *delay conditioning* and *trace conditioning*. In delay conditioning, the CS starts first, and then the US overlaps. One example is the conditioning of making a person blink their eyes: the subject hears a buzzer for some time during which air is puffed into their eye, causing blinking. After sufficient repetition, the person hearing the buzzer will blink (Chance, 2014). In trace conditioning, there is no overlap between CS and US. The CS starts and finishes before the US, with a period of no stimulus in between both. Following the previous example, starting the puffing of the air after the buzzer stops would be trace conditioning and lead to the same result as delay conditioning. In *simultaneous conditioning*, CS and US start and finish at the same time. In The-Little-Albert-Experiment, the metal was struck a few seconds after the infant interacted with the mouse; therefore, the experiment used delay conditioning. Those who regularly feed their pets at the same time may not be aware that they are using *temporal conditioning*. As animals have a biological clock (Cassone & Kumar, 2015), it can serve as a CS. Salivation will start just before the next feeding period takes place (Faculty of Humanities and Social Sciences Athabasca University, 2019).

The conditioning procedures in the last paragraphs followed variances of (time) periods. However, conditioning procedures can also follow *nth-step procedures*. For example, in second-order conditioning, CS1 can signal a US using forward conditioning, then CS2 can be paired with CS1, yielding the same US (Davey, 1998). Finally, Rescorla (1967) found that conditioning does not necessarily mean that one event determines the occurrence of another event. Using a *zero-contingency procedure*, sometimes pairing CS with US, but the US does occur at times without the preceding of CS. The prediction, that event B will follow event A, rather than the pairing of A and B, are determining conditioning.

2.6 OPERANT CONDITIONING (1938)

Pavlov's observations focused on involuntary or natural behavior. Watson, the conductor of The-Little-Albert-experiment, was convinced that respondent conditioning would be able to explain the entirety of human psychology, implying that everything from language to emotions are results of S-R pairings (Watson, 1924). Watson was a controversial researcher, for his

ethically questionable experiments, for entirely neglecting the existence of mind and consciousness (McLeod, 2018), and also finally his romantical advances with his then 21-year old assistant Rosalie Raynor, co-author of The-Little-Albert-experiment, which lead to the termination of his professorship at Johns Hopkins University Baltimore in 1920 (Aalai, 2015). Despite numerous theoretical shortcomings, and the relationship between Watson and Raynor even becoming the inspiration for the plot of a TV-period drama show (Lloyd, 2013), a number of his research results are still misleading today's theories on child development (Narvaez, 2011).

Psychologist B. F. Skinner gained influence in the field of behaviorism, especially after Watson left the academic world to pursue a career in advertisement and laying the foundation of behavioral marketing (Bartholomew, 2013). Substantially, Skinner's behavioristic approach does accept that internal mental processes exist, and, therefore, respondent conditioning falls short in explaining all aspects of human behavior (Skinner, 1938). Nevertheless, he acknowledges that the behaviorist's approach to investigating the causes of actions and their consequences facilitates scientific research (McLeod, 2018).

Skinner's operant conditioning bases on the Law of Effect and expands by introducing variations of positive and negative reinforcers, and punishment. The main difference between instrumental and operant conditioning is that classical conditioning focuses on involuntary behavior, or reflexes, while operant conditioning focusses on strengthening or weakening voluntary behavior (Cherry & Gans, 2019). The terms behavior and response are synonyms, while both underline that not the subject of the treatment itself is conditioned, but its actions (Encyclopaedia Britannica, 2015).

2.6.1 REINFORCEMENT, PUNISHMENT, AND EXTINCTION

Positive and negative reinforcement are increasing the probability of the occurrence of the targeted response (Schultz, 2015; Skinner, 1938). Positive reinforcement operates through a rewarding response or providing a rewarding stimulus following the targeted response. Negative reinforcement, on the other hand, operates either through the object attempting to remove an undesired stimulus by executing the targeted response or by avoiding the occurrence of the undesired stimulus by following the targeted response.

Positive and negative punishment is reducing the probability of the occurrence of the targeted response. Positive punishment operates through an aversive stimulus following the targeted response. Negative punishment operates through the removal of a stimulus by

executing the targeted response. For clarification, positive punishment could be called “*punishment*” and negative punishment “*penalty*”. An example of punishment is yelling at a child for showing undesired behavior; an example of a penalty is taking away a toy from a child for showing undesired behavior.

The same effects of extinction, generalization, discrimination, and contextual factors that occur in instrumental conditioning apply here, too.

2.6.2 INFLUENCERS OF REINFORCEMENT EFFECTIVENESS

Several different schedules of reinforcement can be applied (Ferster & Skinner, 1957; Killeen, Posadas-Sanchez, Johansen, & Thrailkill, 2009), which influence learning effectiveness (Segers, et al., 2018). In a *fixed interval schedule*, the reinforcing stimulus occurs *n* time-intervals after the desired response, resulting in the effect that the subject does not respond directly after the reinforcing stimulus, but as the next stimulus approaches (Franzoi, 2015). The interval schedule can also be *variable*, resulting in a response in the average waiting time between stimuli. Furthermore, the number of stimuli can be varied: in a *fixed ratio schedule*, the reinforcing stimulus occurs after a fixed number of responses. Subjects usually pause after the stimulus, but then show a high rate of response. Again, the number of responses can be *variable*, yielding a high and steady rate of response. Applying *continuous reinforcement* will lead the subject to respond as rapidly as possible.

Different situations require an adequate choice of reinforcement schedules. While attempting to teach a new behavior, a continuous schedule might be appropriate for the beginning, while later switching to a periodical schedule. Studies in pedagogical research found that the predictability of continuous reinforcement can lead to extinction, while variable schedules increase response rates (Hulac, Benson, Nesmith, & Wollersheim-Shervey, 2016). That means that after establishing the desired response, the subject may no longer exhibit interest in the reward, and, therefore, terminate the response.

Five different factors influencing the effectiveness of the reinforcement are derived from the results of the different schedules. Handing a dog a treat every time it sits might not work if it got just fed, an effect called *satiation* (Miltenberger, 2008). Delaying the stimulus from the response instead of an instant reward yields slower learning, an effect called *immediacy* (Dunn & Fantino, 1982). The same holds for inconsistent time intervals between stimulus and response, i.e., *contingency* facilitates the learning effect. The *size* or amount of the stimulus may affect the potency of the reinforcing response. Lastly, Skinner introduced *shaping* as a

conditional method (Peterson, 2004), where a trainer identifies the desired response to the subject, and, through numerous trials, approximates the desired response through behavior which the subject already emits.

Thorndike may have assumed that capturing the cats in a hungry state would be a necessary condition for executing the experiment (Mazur, 2013): an organism deprived of glucose, carbohydrates, or fats seeks to accommodate the imbalance, while a jaded organism will not seek to ingest more of it. This principle, homeostasis, has been prevalent in motivation research since Aristotle (cf. 2.1 Motivation in Ancient Greek Philosophy), even explicitly mentioned by Freud (1915) (cf. 2.2 Psychoanalysis and Motivation (about 1900 to 1930)).

In the previous example, the conditioning was bound to a single stimulus and response, yet, it cannot explain behavior by the individual response, but rather through behavioral chains (Boren & Devine, 1968). Behavioral chains are three-term contingencies, where an antecedent triggers the response, which will lead to the desired consequence—for example, seeing a traffic light turning red triggers the behavior of breaking with the consequence of stopping (Doherty, 2018). This example demonstrates that a discriminative stimulus can initiate and reinforce subsequent behavior (Tarbox & Tarbox, 2017).

2.6.3 APPLICATION IN ECONOMICS

Just as Watson found his way into marketing after his termination, corporations use operant conditioning in game-based marketing campaigns. McDonald's famously introduced the Monopoly game, where consumers scratch cards to potentially win a high cash-prize, raising engagement with the corporation as a whole (Zichermann & Linder, 2010), or virtually expanding the game by allowing customers to check-in at different McDonald's restaurant locations and collect those to build a "*monopoly*".

Another stream of research in economics investigates whether investor biases may be rooted in operant conditioning, suggesting that past returns, variables with current prices, accounting variables, or analyst forecasts have conditioning effects (Kent, Hirshleifer, & Siew, 2002).

2.7 FIELD THEORY (1936)

Skinner acknowledged the existence of environment and situational context but did not build his theories around it. Polish psychologist Kurt Lewin stated that behavior (B) is a function of the person (p) and their environment (e): $B = f(p, e)$ (Burnes & Cooke, 2013; Lewin, 1936). Lewin is one of the four influential Gestalt psychologists of the Berlin School of

experimental psychology (Berliner Schule), who emphasized the perception of entire patterns and configurations, as psychological and social forces, rather than isolated parts. The focus lies in describing the whole direct psychological experience of the subject (Encyclopædia Britannica, 2019). Discussing Lewin's theory is of utter importance, as he, other than most researchers at his time, did not pursue the behavioral approach.

The interpretation of his theory got interrupted by his emigration to the United States in 1933 after the Nazi Party rose to power in Germany, resulting in a German stream of researchers who understood Lewin merely as a Gestalt-psychologist, and a US-American stream, who understood him as a social-psychologist (Pratkanis & Turner, 2019). Due to Lewin's early death, no full version of Field theory has ever been published by him, where most formulations stem from his two major publications: *Principles of Topological Psychology* (1936), and *The Conceptual representation and the measurement of psychological Forces* (1938). Nevertheless, a series of main principles are derived from his research (Malcom, 1991). The first to mention is the idea of *Lebensraum* (LR), which is the sum of all possible factors influencing the subject's behavior. The personality traits of the observing individual, characteristics of the observed object, and situational circumstances are influencing the subjectively perceived state of affairs (Jost, 2008). Following the formula above, p and e results in LS , i.e. $B = f(p, e) = f(LR)$. Second, the context or circumstances in which the subject interacts is the *environment* (e), which describes the overall psychological perception of a subject in a particular situation, including both the conscious and the unconscious. Aspects of the subjective perception may be analyzed in isolation; however, to understand the full circumstance of a situation, all inputs must be analyzed (Lück, 2001). Finally, Lewin provided three different ideas of what the *person* (p) is: the sum of needs, beliefs, values, and abilities of an individual, a representation of the psychological facts of the *Lebensraum*, or the "*behaving self*". The resulting *behavior* (B) emerges from change within the *Lebensraum*, i.e., any action of the person or a change of a state in the environment is behavior. The surrounding of the subject consists of a totality of coexisting facts, which create an interdependent dynamic field in which changes of one part of the field affect the other parts (Burnes & Cooke, 2013). Here, we might see that Lewin drew inspiration from theoretical physicists like Albert Einstein, who, around the time of the publication of Lewin's work, broadly worked on developing a unified field theory which aims to bundle all fields of physical forces and matters of the universe into one formula (Die Zeit, 1950).

In field theory, the life of a subject consists of different spaces, which, in their sum, create one field or an environment (Deutsch, 1954). A person with a goal will have to pass through several spaces to reach it. Here, the importance of the individual experience becomes evident: Pavlov, Skinner, or Watson imply that for any person reaching the same goal, the experience must be the same. In field theory, individuals with the same goals may have to pass through different fields, confronting them with diverse levels of obstacles or support. As the fields are subject to dynamic and constant change, even the experience of one event may be different for different persons. Here, we also see a significant difference in the psychoanalytical approaches of the time, which see behavior as a function of the person's history – therefore, Freud's interest in child development (Pratkanis & Turner, 2019).

After his emigration and probably due to his personal experience, Lewin's applied his theory on the problems of social conflict and prejudice by examining the Lebensraum of the conflicting parties (Lewin, 1997). He stated that the Lebensraum of minority group members provides more obstacles and barriers within their field, also in a geographic term (e.g., ghettos). In his analysis, he suggests removing these obstacles and permits social mobility to eliminate intergroup conflict (Lewin, 1947).

2.8 SOCIAL LEARNING THEORY (1960)

By incorporating principles from both behaviorism and cognitive theorists, social learning theory attempts to explain how individuals learn through observation of others (Bandura, 1977).

The foundation of social learning theory bases on ideas presented by Skinner, where he suggested that the acquisition and development of language skills is a result of operant conditioning (Skinner, 1948). At the same time, students of Hull expanded on his drive theory by suggesting that a drive of imitation exists (Miller & Dollard, 1941). Presenting an approach that would take the environment and situational-specific context into account, US-American psychologist Julian B. Rotter wrote in *Social Learning and Clinical Psychology* that the subject's personality and environment influence probabilities of behavior (Rotter, 1980).

Criticizing Skinner's explanation for requiring several trials before behavior is reinforced and Rotter for implying that several possible responses would exist, Canadian-US-American psychologist Albert Bandura suggests that learning is a cognitive, rather than a behavioral process, that can work through both observing behavior and the respective consequences, making decisions about the performance of behavior, is not depending on reinforcement, and

is not an entirely passive process (Ormord, 1990). He correctly argues that operant conditioning fails to explain how some behavior is emitted as desired in the first trial, as well as how subjects imitate behavior through observation, i.e., never experiencing the reinforcement themselves. Indeed, Bandura only identifies motivation and reinforcement as one of four components required for observational learning, where the others are attention, retention, and motoric reproduction (Bandura, 1997). Nevertheless, especially attention and retention could be attributed as premises for conditioning, too, as they are quite fundamental for cognition as a whole – a critique voiced by many behaviorists. Following the academic debate, at later points, Bandura would shift the focus from how subjects would follow models, to the importance of self-efficacy, i.e., the beliefs and judgments about our abilities (Biglan, 1987).

2.9 ACHIEVEMENT MOTIVATION (1964)

US-American physician and psychologist Henry A. Murray expressed in his book *Explorations in Personality* (Murray, 1938) that individuals experience pleasure from developing and exercising skills to achieve goals, rather than the achievement of a goal per se.

Expanding on this idea, US-American psychologist David McClelland argued that humans have a generally sub-conscious drive for achievement, affiliation, and influence, i.e., declaring those as the three sources of all motivation (McClelland, Atkinson, Clark, & Lowell, 1953). Achievement, in particular, is a need for driving the desire for problem-solving, complex task-mastery, goal-setting, and receiving feedback on success (Atkinson, 1964). While being sub-conscious, the need for achievement is learned through positive associations between achievement and positive emotional states (Deci, 1975).

McClelland's approach does not explain how individuals select goals, nor how different individuals strive for the achievement of different goals. Building on the ideas of McClelland, his colleague of earlier years and pioneer of using scientific methods in motivation research, US-American psychologist John Atkinson completes the theory by introducing two additions: one, the selection of the goal builds on a tendency to strive for success while trying to avoid failure. Two, the perceived probability of success or failure factors into goal selection, as well as the individual's values, i.e., degree of pride in achievement vs. degree of shame in failure (Hill & O'Dell, 2019).

As denoted in an economic context by Jost (2008) and discussed by Klein and Walsken (2018), Atkinson (1964) suggested a formularization of his approach with the magnitude of success being M_s and of failure M_{af} , with an incentive-value of I_s or, respectively I_{af} . The

subjectively derived probability of success is P_s , and of failure is $P_f = 1 - P_s$. We expect the performance motivation of an individual to depend on their effort-level E , yielding $PM(E) = P_s * (I_s * M_s) + (1 - P_s) * (I_{af} * M_{af})$, where $U(succes) = I_s * M_s$ and $U(failure) = -I_{af} * M_{af}$. Atkinson added that $U(success)$ also depends on the complementary probability of $U(failure)$, i.e. achieving a desired outcome on a task with lower probability of success yields a higher utility than accomplishing a task with a high probability of success, denoted as $I_s = 1 - P_s$ and $I_{af} = -P_s$, yielding $PM(E) = P_s * ((1 - P_s) * M_s) + (1 - P_s) * (-P_s * M_{af})$.

Taking a closer look at the provided variables, we can see that the chosen effort level is merely influenced by the individuals' intrinsic motivation, disregarding any cases where external rewards or incentives may have an impact on the performance motivation (Coombs, Dawes, & Tversky, 1970). The lack of external incentives will make the individual choose an effort level that maximizes utility (Maehr & Sjogren, 1971). The individual will choose an intermediate level of effort where $P_s = 0.5$ if $M_s > M_{af}$, and either the lowest or highest level of effort where $P_s = 0$ or 1 if $M_{af} > M_s$.

While some approaches in motivation research already acknowledge the cognitive complexity of individuals and how it may affect preferences, McClelland and Atkinson (1948) showed in experimental studies that situational preferences influence cognition.

Atkinson's approach is one of the first to implicitly researching motivation within a professional environment while relying on Tolman's notion of "expectancy of goal" (Tolman, 1932). He states that his theory of achievement only applies if the individual expects evaluation of their performance, either due to external feedback or self-assessment (Atkinson, 1964). Vroom (1964), on the other hand, assumed that any action might result in a variety of potential outcomes, where the force to perform an action F_i is determined by the valence of each potential outcome V_j and the expectancy that the action leads to the potential outcomes E_{ij} , i.e. $F_i = f[\sum_{j=1}^n E_{ij} * V_j]$. Now, adding the second order outcomes, we can observe the major difference between Atkinson's and Vroom's approaches, which is the substantial importance of extrinsic motivation (Deci, 1975, p. 111): "*Valence of an outcome (V_j) is determined by (1) the valence (V_k) of all other outcomes (call them second order outcomes) which outcome j might help one achieve, and (2) the instrumentality of outcome j for achieving each second-order outcome k .*". In an algebraic notation: $V_j = f[\sum_{k=1}^n V_k * I_{jk}]$. This means, the valence of an outcome is interrelated with the valence of other outcomes. Deci states that since both theories at their core

suggest that behavior is the result of weighing the probability of achieving a goal against its valence roots from Tolman.

2.10 ATTRIBUTION THEORY (1958)

Attribution theory is the result of an agreement between the nature- and nurture point of view of personality (Thompson, 2019). Assuming that individuals are trying to understand the motivation of their actions, they will link success and failure to their current thinking and behavior. The way individuals perceive themselves and how they explain their behavior is an accurate predictor of persistence in challenging tasks, as well as the level of effort (Grant, 2008). The attribution follows a homeostatic principle: if an individual perceives themselves as not good at a task, the unexpected success will be attributed to external circumstances, whereas an individual expecting to perform well on a task will attribute their success to their abilities (Festinger, 1957).

US-American psychologist Bernard Weiner developed a three-dimensional classification of attributes that define personality (Weiner, 1991). First, the *locus of control* indicates the attribution of success and failure to either (internal) personal ability or (external) circumstances. The second attribute, *stability*, describes the individual's perception of their ability to influence the cause of their success or failure. Lastly, *controllability* describes how the individual perceives their power to alter the behavior or circumstance or whether it is out of their control.

Weiner's theory is mainly used in the field of performance motivation with a focus on application in education (Weiner, 1972).

Furthermore, in the sense of expectancy theory, Weiner suggests that the perceived probability of success vastly contributes to chosen behavior. For example, a student who expects the probability of their success in a test to be very high or low will probably put little effort into their preparation (Mischel, Jeffery, & Patterson, 1974; Weiner, 1991). Here, we reach the point where Lewin's theory of motivation (Lewin, 1936), Atkinson's achievement theory (Maehr & Sjogren, 1971), and principles from Weiner's attribution theory can be bundled into a single robust model of achievement choices through three dimensions: expectancy of success, beliefs about one's abilities and competences, and subjective task values (Feather, 1988; Wigfield, Tonks, & Eccles, 2004). Expectancy is a major key factor as it considers previous experiences, which in similar situations will shape the anticipated outcome. This insight is the rationale for educators creating learning environments where students can experience success

at the beginning of their studies to assure motivation for future academic success and create resilience in stressful situations (Rotter, 1975).

According to Jost (2008), causal attribution is the result of predictive judgment in the context of causality and points of reference. An individual will, during the process of attribution of actions, consult contextual factors. We have to understand how one contextual factor will be attributed as causing an action. Weiner (1985) suggests that unexpected events play a significant role, e.g., a colleague leaving two hours earlier than usual. The individual's context differs, and framing-effects (Tversky & Kahneman, 1981) influence how the individual's choice of attributed contextual factors. Now, we need to understand how using points of reference works to form the causal judgment. Einhorn and Hogarth (1986) suggest four points of reference: one, the *covariation* between two events determines the degree of their causality, i.e., how an event and an action occur at the same time. Second, the *chronological order* of events determines which might be the cause and which the effect. Third, the contiguity, i.e., the chronological and spatial sequence, determines a causal relationship. Lastly, the *similarity* between two events refers to the physical resemblance or the length and intensity of the cause and effect. If an event occurs only once, points of reference are far more critical than in re-occurring events, as those provide more information from multiple observations and facilitate the determination of relative probabilities.

Attribution theory makes it appear as if actions could always be attributed to reasoning. In reality, several attributional biases distort causalities (Heider, 1958). The *fundamental attribution error* is “[...] *the tendency to overestimate the degree to which an individual's behavior is determined by his or her abiding personal characteristics, attitudes, or beliefs and, correspondingly, to minimize the influence of the surrounding situation on that behavior (e.g., financial or social pressures)*” (American Psychological Association, 2018; Jones & Harris, 1967; Ross, 1977). The fundamental attribution error is highly active in situations where individuals attempt to explain the behavior of others, mostly focusing on the actor and not their (possible) circumstances. When evaluating own behavior, however, the effect is reversed, i.e., contextual circumstances are being exaggerated, especially when evaluating negative outcomes – a phenomenon coined as *actor/observer difference*, since the perception of own behavior differs from observing the same behavior in somebody else (Canary & Spitzberg, 1990). If an individual accredits success for an outcome to themselves while denying their responsibility for failure on external factors, they may be subject to the *self-serving bias*, a form of self-deception to lift the locus of control and self-esteem (American Psychological Association, 2018).

In the case an individual is encountering an event for a repeated time, we may assume that they were able to conduct a covariance between an event and the cause, i.e., a statistical causal attribution (Einhorn & Hogarth, 1986). Kelley's covariation model (1973) suggests that internal and external attribution works through three criteria: the *distinctiveness* of the event in comparison to other events, chronological *consistency*, and *consensus* (Kelley, 1967). If the behavior is distinctively different between one occasion compared to another, i.e., the covariance is high, the individual may attribute it to external factors. If the behavior in one particular repeated situation is the same, the covariance of consistency is high, and the behavior will be attributed to the individual, i.e., internal factors. If the behavior is profoundly different from what other individuals would exhibit in the same situation, the covariance of consensus is low, and the behavior will be attributed to internal factors.

We have discussed some essential cognitive errors which may occur in the process of attribution, but the overall number of researched biases or errors is much higher, as listed by Jost (2008).

2.11 EFFECTANCE MOTIVATION (1959)

In 1959, US-American psychologist Robert W. White published his influential paper *Motivation reconsidered: The concept of competence* (1959), developing what shall become known as *Effectance motivation* by incorporating shortcomings of Freud and Hull's approaches. Most importantly, he suggests that *competence*, which he describes as "[...] *an organism's capacity to interact effectively with its environment*" (White, 1959), is an essential factor lacking in previous theories. He suggests that competence is slowly acquired through learning, and drives or instincts cannot explain the motivation for acquiring competence. By observing cats, animals, or monkeys, White explains that a lot of their behavior is exploratory: rats, for example, would even endure electric shocks if it would allow them to investigate their new territory (Dashiell, 1925; Nissen, 1930), even if it would not serve any of their natural needs. Drive-theorists argued that the behavior of the laboratory animals could be explained through their drive to follow the reinforcement to reduce anxiety, i.e., primary rewards have been paired with the exploration of novelties. This inclusion implies that virtually all responses occur for the sake of reducing anxiety – an implication which White thought as being unrealistic (White, 1959).

Frontiers of Motivation Research on Feedback

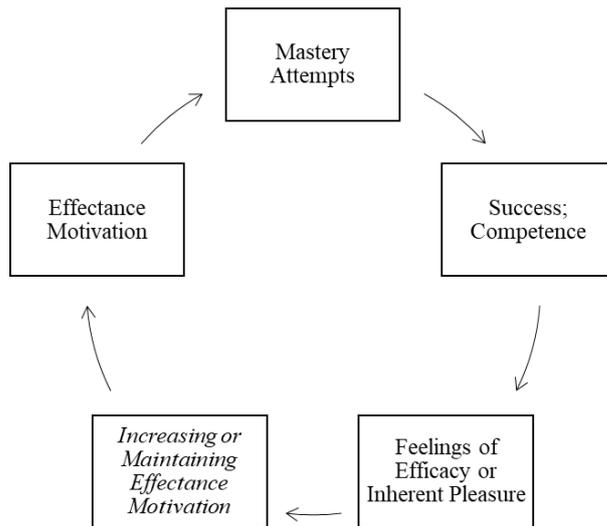


Figure 1 White's Basic Model of Effectance Motivation as Presented in Harter (1978)

White appears to be one of the first motivation researchers to incorporate first findings from neuroscience into his theory, as he quotes Morgan (1957), who stated that drives are results of responses of the central nervous system. He used this finding to declare that for the matter of motivation research, it cannot be longer argued that all sources of motivation are of external nature. Indeed, this makes White's publication the first theory to focus on intrinsic motivation (Deci, 1972).

Therefore, White's theory argues that in addition to drives and instincts, a "[...] *tendency to investigate matters of concern, to master techniques or skills, or to engage fully in the environment in general* [...]" exists (cf. Figure 1 (Sabir, 2014)).

2.12 EFFECTANCE MOTIVATION RECONSIDERED (1978)

The idea of Harter's expansion on White's effectance motivation theory (1959) considers the need and enjoyment of task mastery (Harter, 1978). She adapts the neologism "*effectance*", as it captures that the individual is attempting to affect the environment, dealing effectively with the environment, and, if successful, experiences feelings of efficacy (Harter, 1978, p. 35). Harter criticized the model for lack of explanatory value and formularization and suggests four dimensions of effectance motivation: response variation, curiosity for novel stimuli, mastery for the sake of competence, and preference for challenging tasks, where the latter two correspond to Deci (1975).

The reconsidered model extends from White's initial focus on success towards capturing the effects of failure, more precisely the relationship between the degree of challenge and the corresponding amount of gratification from mastery (Harter, 1978, p. 44). Harter states that the

degree of pleasure and task difficulty follows an inverted u-shape, as illustrated in Figure 2 (Harter, 1974; 1977; 1978, pp. 44-46).

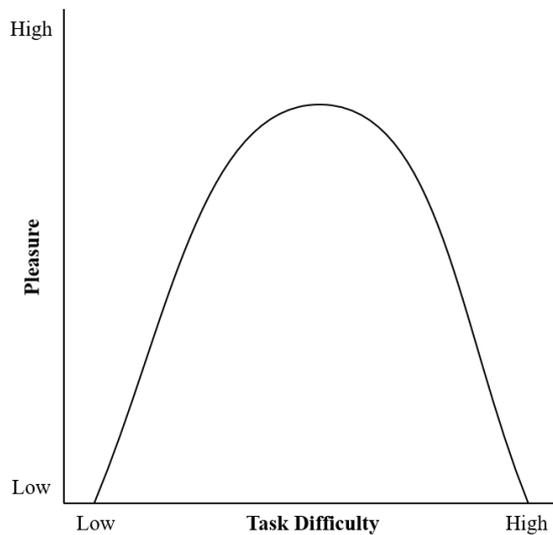


Figure 2 Relationship of Pleasure and Task Difficulty (cf. Harter (1974, 1977, 1978))

When an individual is successful, the success will lead to intrinsic rewards of perceived competence and control. When experiencing failure, intrinsic motivation will vanish, and the need for external incentives rises.

Harter developed a scale for the assessment of motivational orientation, measuring curiosity vs. preference for the familiar, preference for challenge vs. simple tasks, working for self-satisfaction or external approval, preference for an independent master or external dependence, internal criteria for success/failure or external definitions of success/failure (1978, pp. 60-61). The scale has been developed for the application in educational settings, but also for testing the ecological validity of the model (Harter, 1981).

2.13 OPTIMAL INCONGRUITY (1965)

William A. Hunt, a US-American scientist-clinician (Matarazzo, 1987), provided a synthesis of the cognitive-behavioral approaches and learning theories, as e.g. of Piaget (Messer, 1993). He suggested that behavior is initiated through incongruity, i.e., a natural (e.g., hunger) or cognitive scheme does not correspond to the psychological standard. The distinction bases on intrinsic and extrinsic motivation, where intrinsic motivation is the result of a cognitive standard, rather than a physiological need.

Hunt suggests that the optimal degree of incongruity motivates the organism to change their behavior and learn from the information provided through the interaction with the environmental situation (Hunt, 1965). Furthermore, he suggested a curvilinear relationship

between the degree of motivation and the degree of incongruity, stating that there is an optimum level of motivation at a certain degree of incongruity. The intrinsic motivation motivates the individual to act until re-establishing congruity. He builds on White's effectance theory (1959) and the principle of homeostasis: curiosity is a motivated response to equilibrate a lack of knowledge, and re-stating congruity will change cognitive structures.

Other than White, Hunt explains competence as a result of a cognitive process, rather than of effectance motivation; however, they agreed that intrinsic motivation could be expressed through a variety of behavior.

2.14 GOAL-SETTING THEORY (1984)

The initial and general idea of goal-setting theory, as developed by US-American psychologists Edwin A. Locke and Gary O. Latham, states that values and goals are cognitive determinants of behavior (Locke & Latham, 1990). An individual's conscious behavior, attention, and actions are directed at fulfilling a goal, since the fulfillment is an emotional experience. Challenging goals can lead to higher levels of effort and enhance goal-persistence, as they force individuals to develop strategies to match their performance to the level required for goal-achievement. Success will lead to satisfaction and motivation, whereas failure will lead to frustration and demotivation.

As Locke and Latham conclude from their meta-analysis (1990):

"These analyses show that people with specific, challenging goals reliably outperform those with do-your-best goals because the latter type of goal is interpreted too subjectively. Moreover, the degree of goal challenge or difficulty is linearly related to performance, given sufficient skill or ability. We concluded that the most effective goals for increasing performance are those that are specific and difficult. With regard to goal specificity, we found that it alone does not necessarily lead to high performance because a goal can be both specific and easy to attain. We found that specific goals in and of themselves affect the variance in performance only to the degree that performance is controllable." (Locke & Latham, 2019, p. 97).

Goal-setting theory was a milestone in work motivation theories and had a still-lasting impact on present research, which Locke and Latham attribute to their inductive approach, which allows further development of the theory. Therefore, Locke and Latham updated the fundamental theory in 2019 to include recent findings (Locke & Latham, 2019). Individuals with assigned tasks that exceed their abilities perform better in do-your-best-setting than with performance goals, usually since individuals with high goals failed to explore alternating strategies due to time pressure. If presented with negative feedback, learning goals for complex activities can be highly effective (Cianci, Klein, & Seijt, 2010), and can be added with

performance goals, as long as the cognitive load is not excessive (Masuda, Locke, & Williams, 2015). Furthermore, learning-goal-orientation can predict performance when applied in combination with a do-your-best goal, as compared to a set learning goal. Other studies have found that for complex tasks, primed learning-goals lead to higher performance than primed performance goals (Chen & Latham, 2014), as well as subconsciously primed goals will lead to higher consciously set goals (Latham, Brcic, & Steinhauer, 2016). A study by Schmidt (2013) valued an annual increase of output of \$9.200 per employee with set goals.

Feedback is a significant moderator of goal-performance effects, as it can provide individuals with information on their progress of goal-attention. Consequently, they may want to adapt their levels of effort or their strategic approach. Goals and feedback, in combination, increase performance better when used individually. A study investigating the impact of negative impact following a complex task has shown that reactions as tension, anxiety, or frustration are more intense in performance goals, as compared to learning goals; learning goals lessen the perceived intensity of negative feedback (Cianci, Klein, & Seijt, 2010). This observation appears to be natural, as individuals usually expect obstacles and challenges in learning processes (Gould, 2019).

2.15 FLOW THEORY (1979-PRESENT)

When individuals fully immerse into an activity, losing the connection to their surrounding environment, and even time, they experience a state of flow (Csikszentmihalyi, 1990). Hungarian-US American psychologist Csikszentmihalyi was the first to research the psychological perspective on this phenomenon (Biscontini, 2020). Formally, he defines flow as “*A state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it*” (Csikszentmihalyi, 1990). Two aspects about the definition are striking: one, it focuses merely on intrinsic motivation, two, the terminus “*enjoyable*”. In his youth, Csikszentmihalyi studied the books of Freud (Cherry, 2018), who described the principle of organ-based pleasure (Freud, 1920; Wallace, 2006), and adapted his definition: pleasures are organ-based in the sense of the later Freudian definition, and enjoyable activities are, e.g., sports, writing, or playing an instrument (Miller K. D., 2019). One can experience flow only actively, which does not necessarily mean that a state of flow is inherently caused by favorable behavior: gamblers, e.g., may experience flow.

Csikszentmihalyi states that ten different markers may indicate that consciousness is reaching a state of flow (Miller K. D., 2019). The first marker is a defined and challenging goal,

in which the individual can clearly recognize successful or failed completion. Following the idea of optimal incongruity (Hunt, 1965), the goal must be just challenging enough to reach a certain level of arousal, yet be not too challenging (cf. Figure 2). Second, the individual must be determined to the activity, i.e., not divide their attention between this and other activities. Third, the individual must be able to experience a sense of pleasure from participating in the activity. Fourth, the individual must experience mindfulness and a lack of consciousness. Fifth, an experience of tranquility and timelessness. Sixth, the individual must receive immediate feedback from their activity, as well as continuous satisfaction. The seventh marker is somewhat interrelated to the first one; the individual perceives themselves as sufficiently competent to complete the task. Eighth, the individual must experience an internal locus of control. Ninth, the individual lacks awareness of their physical needs. Tenth, interrelated to the second marker, is complete focus on the activity itself. Csikszentmihalyi developed a 36-items questionnaire containing five-point Likert scale questions for the ex-post assessment of flow, known as the Flow State Scale, usually applied in sports participation (Csikszentmihalyi, 1990; Jackson & Marsh, 1996). Measuring the achievement of flow is interesting in particular, as flow leads to improved performance (Csikszentmihalyi, 1990). Flow can only be sustained if challenge and skills complexify (Brophy, 1998).

The ten markers of flow exhibit reoccurring principles in the field of (motivation) psychology. As described above, the first marker shows similarities with goal theory and optimal incongruity (Hunt, 1965). Furthermore, markers two and four may be derived from Kahneman's two systems (2011, pp. 19-97), where, in a state of flow, system one, dedicated to fast and unconscious processing of information, is rather active than system two, which is usually used for slow, effortful, and conscious tasks. Neuroscientific findings could also suggest that system one is generally representing arousal, while system two is representing awareness, and for the experience of consciousness, both have to be active (Fischer, et al., 2016). Lastly, markers seven and eight are directly referencing two of the three basic psychological needs, as described by White's effectance motivation theory (1959), Hunt's theory of optimal incongruity (1965), de Charms' personal causation theory (1968), and synthesized by Deci and Ryan (1980).

Individuals with autotelic personalities, who engage with an activity where the experience of the activity is the primary goal, i.e., are intrinsically motivated in pursuing the activity, are more likely to experience a state of flow (Nakamura & Csikszentmihalyi, 2002; Engeser &

Rheinberg, 2008). This is in line with goal contents theory, a sub-theory of self-determination theory (Kasser & Ryan, 1996).

2.16 PERSONAL CAUSATION (1968)

In 1968, US-American psychologist Richard de Charms developed a theory that is based around the assumption that intrinsically motivated individuals see themselves as the cause of their behavior, and therefore experiences personal causation (de Charms, 1968). In his fundamental postulate of motivation, he explains: “*Man’s primary motivational propensity is to be effective in producing changes in his environment. Man strives to be causal agents, to be the primary locus of causation for, or the origin of, behavior; he strives for personal causation*” (de Charms, 1983). In a sophisticated experimental setting, de Charms confronted participants with variations of stories with testing the what he called Origin-Pawn variable. Participants should rate the perceived degree of autonomy of the hero of the story, or instead how much he should feel like a “*pawn*”, or like an “*origin*”, i.e., somebody whose decisions, goals, and behavior is externally decided upon, vs. somebody subject to autonomy in all of these dimensions (de Charms, 1983).

He explains that four capabilities determine whether an individual can be subject to personal causation. The first is self-observation, where the individual in a positive state of affairs is encouraged to explore their private knowledge about their motives. The second is the internal determination of objectives: the individual should be able to set short- and long-term goals within the situational conditions. Third, the individual should be able to plan realistic and precise actions for planned and objective-driven behavior. Lastly, the individual should be capable of taking responsibility for their goals and attempts and experience both success and failure (de Charms, 1983).

In de Charms’ theory, the focus lies on the perception of being the origin of their behavior, and the behavior is always express in order to gain rewards/be successful or avoid punishment/experience failure (Sherrod, Hage, Halpern, & Moore, 1977). Furthermore, individuals experiencing personal causation show increased feelings of competence, and are, therefore, higher intrinsically motivated.

2.17 FEEDBACK INTERVENTION THEORY (1996)

Feedback interventions are: “[...] *actions taken by (an) external agent(s) to provide information regarding some aspect(s) of one’s task performance.*” (Kluger & DeNisi, 1996), and provide knowledge of results and performance effectiveness (e.g., number of written e-

mails per hour) over a variety of tasks. The definition excludes internal natural feedback (homeostasis, intrinsic feedback), task-inherent feedback, personal feedback, and feedback-seeking behavior (Kluger & DeNisi, 1996).

Feedback intervention theory stems from the Law of Effect (Thorndike, 1927): positive interventions are reinforcers, negative interventions punishers, and should both result in learning. Studies and theories attempting to explain conflicting results when the anticipated effect would not occur were investigated in the meta-analytical approach of Kluger and DeNisi (1996). Following the analysis, they formulated the feedback intervention theory, which would integrate existing theories and account for their shortcomings. The five principles state that behavior-regulation works through comparison of feedback to goals (or standards), goals follow a hierarchy, due to limited attention, not all feedback-standard gaps receive attention, the moderate level of the hierarchy usually receives attention. Feedback interventions impact the locus of attention (Kluger & DeNisi, 1996, p. 259). The idea of feedback-goal-comparison stems from goal-setting theory (Locke & Latham, 1990) and bases on the creation of a feedback sign, i.e., an evaluation of the result compared to the goal. As a reaction to a negative feedback sign, individuals may either increase their effort, change or abandon the goal, or reject the messenger (Bandura & Cervone, 1983; Bandura, 1991; Ilgen & Hamstra, 1972). Repeated severely negative feedback interventions may lead to helplessness (Abramson, Seligman, & Teasdale, 1978). The hierarchical order of goals follows the idea of Maslow's pyramid of needs (1943), with goals of the self at the top, and physical action goals at the bottom.

Kluger and DeNisi differentiate “[...] *meta-task processes* involving the self, *task-motivation processes* involving the focal task, and *task-learning processes* involving the task details of the focal task.”⁴ (1996, p. 262). When an individual receives cues about their performance, these will direct their attention towards the necessary level of processes. Cues can be normative and focus on meta-task processes, intervene on velocity, e.g., direct attention at past performance, and influence task-motivation processes, or be corrective, and influence task-learning processes. All three will have an impact on overall performance (Kluger & DeNisi, 1996, p. 268). Cues directing attention at the self seem to have “*attenuate*” FI effects on performance, while cues directing attention at the focal task or details of it seem to “*augment*” performance.

⁴ Italics adapted from source

The findings of feedback intervention theory show several similarities with self-determination theory: the attenuating effect could result from affecting perceived competence, as it directly links a result to the individual, and not to the task. The augmenting effect may be a form of informational feedback, as it enables learning and supports the individual.

2.18 DISCUSSION

Reflecting upon the discussed theories, we quickly realize that some overarching concepts are used throughout theorization: for instance, homeostasis, or conditioning, are fundamental ideas that appear in one or another form throughout several theories. Considering chronological sequences and substantial similarities, we can develop a network-graph displaying the interrelations of theories, as illustrated in Figure 3. The approach of connecting the theories does not imply that they are based on each other, but rather that they allude to similar ideas. Looking at the center of the network graph, we see *Self-determination Theory*, *Feedback Intervention Theory*, and *Effectance Theory Reconsidered*. These three theories exhibit the highest number of nodes, i.e., connections to other motivation theories. It is not astonishing that feedback intervention theory and the reconsidered effectance theory are so close to self-determination theory, as they borrow some of the fundamental principles: Kluger and DeNisi (1996) underline the importance of perceived competence, just as Harter (1978).

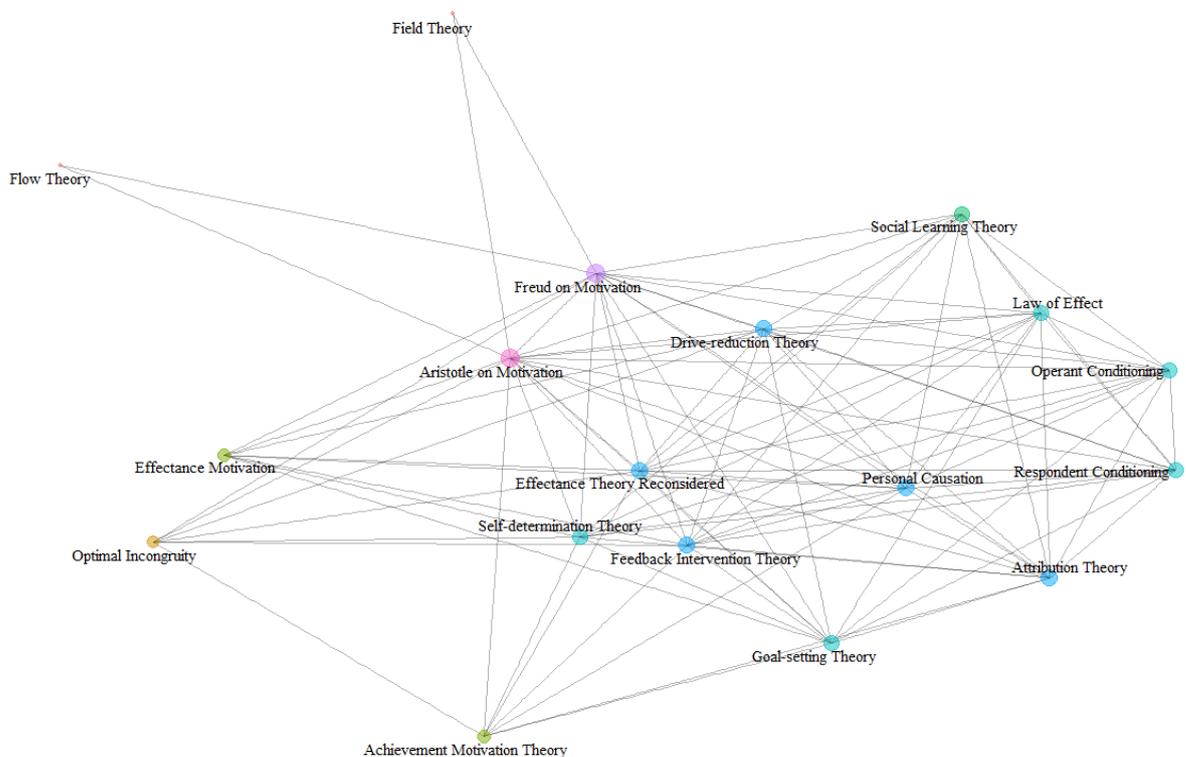


Figure 3 Interrelations of Motivation Theories

At this point, we can already recognize that self-determination theory offers a kind of synthesis of motivation theories. In the following chapter, we will take a closer look at this theory and analyze the principle of successive theory-building.

2.19 CONCLUSION

Looking back at the historical process of developing motivation theories is fascinating. In the early beginnings of motivation in Greek philosophy, we saw the inspiration drawn from biological processes and abstraction of observations from everyday life. With the emergence of psychoanalysis, the discourse changed drastically towards the analysis of how the (social) environment shapes motivation through conditioning. Furthermore, the research field split into micro- and macro-theories were the first focus on explaining motivation in narrow settings, and the latter to develop a comprehensive understanding, ideally with algebraic derivations.

Throughout history, several concepts in motivation emerged, disappeared, and re-emerged again, either explicitly or implicitly in new theories. With increased fragmentation and constant theorization, the field necessitates a unifying theoretical framework that allows adaption and ongoing renewal of details, without falsifying the entire concept. The history of motivation research has shown that underlying ideas, generally on an abstract level, provide high explanatory power, while situation- and social environment-contingent approaches usually allow no generalization.

3. SELF-DETERMINATION THEORY (1975 TO PRESENT)

Self-determination theory is a macro-theory developed along with the principles and contributions of US-American psychologists Richard M. Ryan and Edward L. Deci (Ryan & Deci, 2019). It is the most widely researched and applied theory in the field of psychology. The foundations of self-determination theory lay in a slender theory of intrinsic motivation (Deci, 1975; Deci & Ryan, 1980) and got expanded and adapted to become a general theory of behavior (Ryan, Connel, & Deci, 1985). Following the previous research of behavioral psychologists, which mainly focused on investigating the impact of external factors on behavior, Deci's attention on intrinsic motivation was a somersault in this field.

After decades of various theories approaching, describing, and attempting to predict behavior, self-determination theory was the beginning of synthesizing multiple theories into one single macro-behavioral approach. The ambition was to incorporate situational motivation, psychological development, differences between individuals, and be predictive, and consider evolutionary, biological, and socio-cultural evidence (Ryan & Deci, 2019, p. 113). Wallace and

Gach stated: “The *complete* perspective on any aspect of the mentation, motivation, and behavior of the sufficiently-intact human being is always *sociopsychobiological*”⁵ (Wallace & Gach, 2011, p. 760). The focus of the theory lies in the *self*, which is at all times, actively processing, assimilating, coordination, and regulating internal and external inputs. Intrinsic motivation is a result of the individual’s perception of their autonomy, competence, and relatedness (Deci, 1975). These three factors, called the *basic psychological needs*, are distinctive from behavioral motives and, with a higher degree of fulfillment, lead to psychological growth, integrity, and wellness, i.e., true self-regulated functioning (Ryan & Deci, 2019, p. 115).

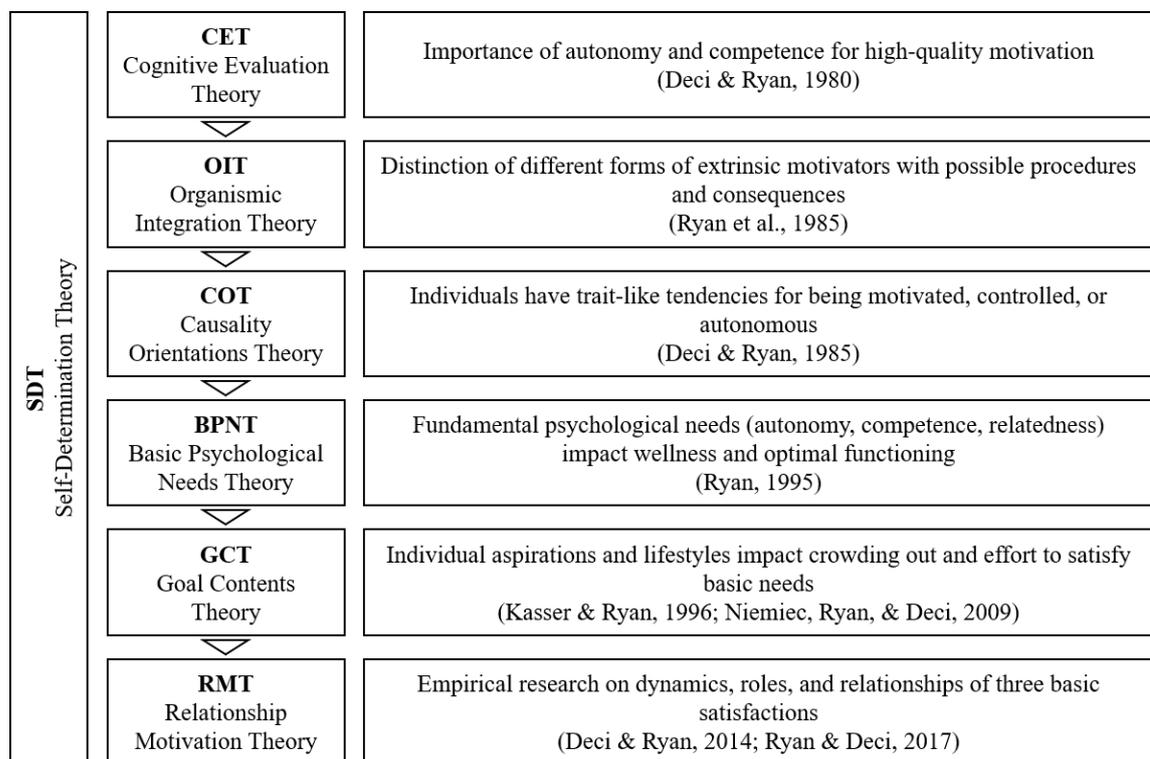


Figure 4 Development of Self-Determination Theory

3.1 THE SIX MINI-THEORIES

As the goal of self-determination theory is to unify several aspects and approaches of behavior into one system, it consists of six underlying theories that got developed over an extended period (see Figure 4), which will be discussed in the following paragraphs.

3.1.1 COGNITIVE EVALUATION THEORY (CET) (Deci & Ryan, 1980)

The first approach, cognitive evaluation theory, focused merely on intrinsic motivation, which Ryan and Deci defined as: “[...] *the spontaneous propensity of people to take interest in*

⁵ Italics adapted from source

their inner and outer worlds in an attempt to engage, interact, master, and understand.” (2019, p. 117), and focusses primarily on the variations in intrinsic motivation. The term *intrinsic motivation* has been coined by Harlow in his studies of primates, especially how intrinsic motivation can get disrupted by external factors (1950). CET includes both social psychology, i.e., how social inputs and contexts affect intrinsic motivation, as well as the personality perspective, as it explains the core of human nature (Ryan & Deci, 2017, pp. 123-125).

Not all extrinsic rewards cause a crowding-out of intrinsic motivation, but if the rewards are perceived as a means of control, they do diminish intrinsic motivation. This observation corresponds to de Charms’ explanation of the locus of control (1968); more precisely, the shifts from the *internally perceived locus of causality* towards an *externally perceived locus of causality*, as it frustrates the basic psychological need for autonomy (Deci & Ryan, 1980). On the other hand, external rewards that are effectance relevant, i.e., possess an informational component, enhance intrinsic motivation, which stands in line with White’s effectance theory (1959). Informational rewards support how the individual perceives their competence. Any factors which are increasing the internally perceived locus of control, the sense of autonomy, and perceived competence will enhance intrinsic motivation, where factors decreasing those will lead to the opposite effect, respectively. For example, receiving positive feedback enhances intrinsic motivation, as it supports the perceived competence and autonomy (Deci, 1971). The perceived competence is an essential factor. Yet, on itself, it is insufficient.

Task-noncontingent	Reward is given for presence
Engagement-contingent	Reward is given for engaging with target activity
Completion-contingent	Reward is given for completion of target activity
Task-contingent	Combination of both engagement- and completion-contingent rewards
Performance-contingent	Reward is given for specific performance, e.g. surpassing a threshold
Competitively contingent	“Winner takes it all”, loser receive no or less reward

Figure 5 Taxonomy of Tangible-Contingent Rewards (Ryan, Mims, & Koestner, 1983)

The development of cognitive evaluation theory included a taxonomy of contingencies of tangible awards (see Figure 5 (Ryan, Mims, & Koestner, 1983)). Task-noncontingent rewards do not undermine intrinsic motivation (Deci, 1972). Engagement-contingent rewards, which

require task-involvement, but not completion, as well as completion-contingent rewards, which require both involvement and completion, undermine intrinsic motivation (Deci, 1971; Deci, 1972). Performance-contingent rewards show a very high risk of undermining intrinsic motivation, as they exhibit a controlling functional significance, while the competence-assuring aspect of the reward may sometimes lead to contrary results (Ryan & Deci, 2017, pp. 132-134). Large undermining-effects occurred in the competitively contingent reward when individuals got communicated a maximum reward, which cannot be fully achieved, as well as when the “losing” individuals receive no reward at all (Ryan & Deci, 2017, p. 134).

Cognitive evaluation theory is distinct from Bandura’s social cognitive theory (1989) and Csikszentmihalyi’s flow theory (1990) as it underlines the importance of both competence and autonomy satisfaction for sustainable intrinsic motivation, while self-efficacy and optimal challenge are directed towards competence, but neglect autonomy (Ryan & Deci, 2017, p. 124).

3.1.2 ORGANISMIC INTEGRATION THEORY (OIT) (Ryan, Connel, & Deci, 1985)

Although cognitive evaluation theory was primarily concerned with intrinsic motivation, also, probably as a counter-concept of most behavioral approaches at this time, organismic integration theory is concerned with behavior emerging from its instrumental value. External motivation in self-determination theory is defined through controlled and autonomous behavior “[...] as *instrumental motivation, and thus concerns all activities aimed at achieving outcomes separable from the behavior itself.*” (Ryan & Deci, 2019, p. 120).

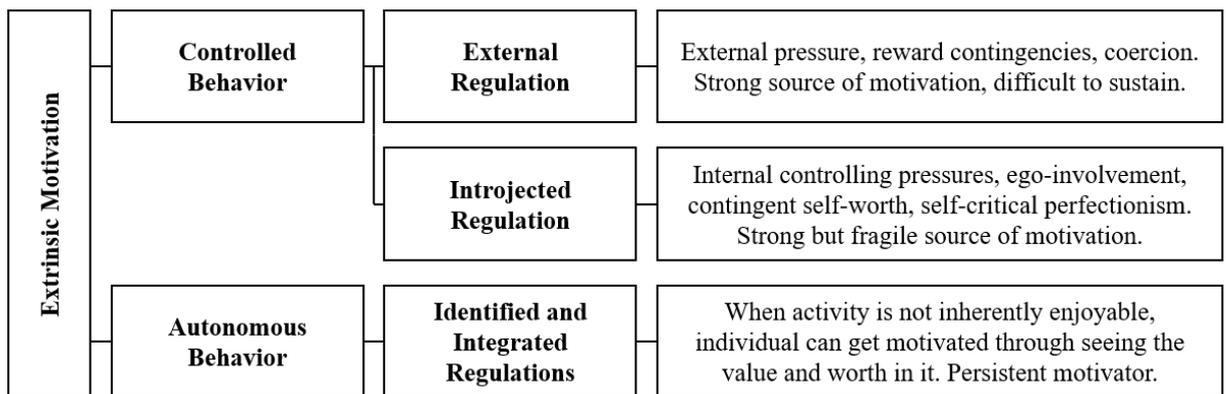


Figure 6 Extrinsic Motivation

Controlled extrinsic motivation can occur through control or pressure, which the individual either perceives through external sources or introjection⁶. External regulation relies

⁶ The term appears in ego psychology (cf. „A process in which an individual unconsciously incorporates aspects of external reality into the self, particularly the attitudes, values, and qualities of another person or a part of another person’s personality. [...]” (American Psychological Association, 2018)), but Ryan & Deci distance

on an externally perceived locus of control and harms perceived autonomy (Ryan & Deci, 2017, pp. 184-185). While being a well-studied enabler of short-term behavior, individuals will perceive their behavior as instrumental. Removing the motivator will most likely cause the individual to stop exhibiting the behavior. Introjection enables the removal of external contingencies (Ryan & Deci, 2017, pp. 185-186). Introjected regulation works similar to external regulation as it is being experienced as a demanding and controlling force, too, but with an internal source. However, behaving in compliance with internal demands can enhance self-esteem and satisfaction. Both regulators have a strong motivational effect; still, the effect is difficult to sustain over a more extended period, especially through external regulation, since the motivation does not stem from affective evaluation from within the individual. Here, we see that self-control does not necessarily mean the individual is experiencing autonomy – the perceived locus of control is rather external (Ryan & Deci, 2017, pp. 186-187). Autonomous extrinsic motivation works through the individual attributing value and worth in a task that corresponds to their other values. While not being as strong, the motivational effect is more persistent than in controlled extrinsic motivation.

Ryan and Deci suggest that the internalization of extrinsic motivation spans from autonomous experience to integrity (2017, pp. 191-195). Figure 6 suggests that identified and integration regulation belongs to autonomous extrinsic motivation, since the perceived locus of control is (somewhat) internally, creating a continuum from non-self-determined behavior starting with amotivation and non-regulation, over extrinsic motivation, i.e., external regulation, introjected regulation, identified regulation, and integrated regulation to intrinsic motivation and regulation.

3.1.3 CAUSALITY ORIENTATIONS THEORY (COT) (Deci & Ryan, 1985)

The causality orientations theory explains why individuals have different degrees of orientations towards the fulfillment of their basic psychological needs and provide information about how individuals act in controlling autonomy-amotivating circumstances. The orientation towards autonomy focusses on the interest in opportunities for growth. Individuals with a higher orientation towards control focus on external contingencies and power structures that guide their behavior. Individuals with an impersonal orientation exhibit performance anxiety and are avoiding failure.

themselves from this technical definition as they see the root of the term in the interplay of the basic psychological needs of autonomy and relatedness

Much research has been done to investigate the correlations between the degree of orientation and exhibited behavior (Ryan & Deci, 2019, pp. 125-127). Autonomy orientation correlates with a greater focus on learning goals, interest, and challenge (Aelterman, et al., 2019), control orientation correlates with a conformist style of identity (Soenens, Berzonsky, Vansteenkiste, Beyers, & Goossens, 2005), and impersonal orientation correlates with a sense of powerlessness and fear of incompetence (McHoskey, 1999).

3.1.4 BASIC PSYCHOLOGICAL NEEDS THEORY (BPNT) (Ryan, 1995)

As cognitive evaluation theory has shown, the three basic psychological needs (autonomy, competence, and relatedness) are determinants of high-quality motivation. At the core of basic psychological needs theory stands the idea that they do determine not only motivation but also the individual's well-being and thriving. Au contraire, the frustration of those needs will lead to ill-being and diminished growth. The satisfaction of the needs varies within a person over the dimensions of time (as well as situations and moments), context, and social interaction and always translates into a change of well-being (Ryan & Deci, 2017, pp. 242-246). The needs are highly correlated and mutually implicated, i.e., to experience well-being, all three must be satisfied.

Autonomy-support facilitates the satisfaction of each basic psychological need, as it enables the individual to satisfy their need for competence and relatedness (Ryan & Deci, 2017, p. 247).

There has been a lengthy discussion of the importance of the three basic psychological needs in different cultures and how far cultures where, e.g., individualism is not of high relevance, could never achieve well-being (Iyengar & DeVoe, 2003). To this critique, Ryan and Deci wrote: “[...] *this is a misinterpretation of the concept of autonomy, as it assumes people cannot autonomously engage in a duty, willingly comply with their parents, or volitionally adhere to collectivistic norms.*” (Ryan & Deci, 2019, p. 124), and: “[...] *SDT claims that in these formulations the concept of autonomy as willingness, empowerment and volition is confused or conflated with concepts of individualism, independence, or non-reliance on others.*” (Ryan & Deci, 2019, p. 131)

3.1.5 GOAL CONTENTS THEORY (GCT) (Kasser & Ryan, 1996; Niemiec, Ryan, & Deci, 2009)

Goal content theory attempts to explain why individuals pursue different life goals, which is of high interest since it explains their daily activities, decisions, and behavior. The theory

shows that a generalization of individuals with intrinsic and extrinsic aspirations is indeed possible: individuals with intrinsic aspirations are striving for intrinsic rewards as fulfilling the goals of their life and giving to the community. Through that, they experience personal growth and well-established relationships. Individuals with extrinsic aspirations are focusing on instrumental outcomes and are, therefore, driven to accumulate wealth or achieve a high status of popularity (Ryan & Deci, 2017, p. 275).

Interestingly, these aspirations are indeed diametral: those focused on earning money or representing a wealthy lifestyle care less (or not at all) about giving to their community (Grouzet, et al., 2005). Individuals putting greater importance on extrinsic goals experience less well-being through the satisfaction of basic psychological needs, whereas their counterparts experience greater satisfaction and well-being through growth or giving to their communities (Sheldon & Krieger, 2014). As Ryan and Deci point out, it is easier to control extrinsic goals, which harms the basic psychological need for autonomy (Ryan & Deci, 2017, pp. 272-279). Therefore, progress and success in achieving intrinsic aspirations will lead to more well-being than compared to extrinsic aspirations.

3.1.6 RELATIONSHIP MOTIVATION THEORY (RMT) (Deci & Ryan, 2014; Ryan & Deci, 2017)

To dissociate self-determination theory from approaches claiming autonomy would be a “*Western*” or “*male*” value, relationship motivation theory underlines that autonomy and relatedness are not opposing goals. In general, the concept in general describes “[...] *willingness, empowerment and volition* [...]”, and, in context of relatedness: “[...] *satisfaction of the autonomy need is as fully important to a high-quality relationship as is satisfaction of relatedness. People need to feel volitional about being in a relationship, and to see the other as volitional, for the connection to be high in quality.*” (Ryan & Deci, 2019, p. 131). Relationship motivation theory provides a more sophisticated understanding of the motivation for sustaining and building relationships. Besides providing relatedness, relationships enable individuals to give or receive autonomy-support, which facilitates the satisfaction of the basic psychological need for autonomy (Ryan & Deci, 2017, pp. 293-297). If both individuals are genuinely invested in the partnership, they may experience autonomous motivation, which enhances their overall psychological well-being, vice versa, the frustration of basic psychological needs will lead to insecurity and ill-being (Ryan & Deci, 2017, p. 305).

3.2 APPLICATION OF SELF-DETERMINATION THEORY IN WORK ORGANIZATIONS

Reflecting on the theories presented in this thesis, none of them so far limited its application on narrowly defined fields. It appears that most researchers expect their findings to be universally applicable, irrespective of context, or even species. Pavlov formulated his theory from observing dogs (1910), Thorndike, from cats (1898). Lewin drew inspiration from physics and mathematics (1936). Bandura, Ryan, Deci, Hunt, and deCharms, for example, all (initially) focused on educational applications of motivation or deduced experiments within educational settings. This raises the question of how far we can and should apply these motivation theories to organizational settings.

As outlined in previous chapters, the approach towards self-determination theory was to provide a counter-concept to the grand theories of that time, which attempted, and, unfortunately, failed to grasp and explain the full extent of human behavior (Sheldon & Prentice, 2017). The strength of this approach lies (1) in not categorically rejecting, but incorporating basic ideas of other theories, (2) constructing a framework which allows for continuous adaption and expansion, and (3) empirical testing of these mini-theories.

Vansteenkiste, Niemiec, and Soenens (2010) provided an overview of the empirical basis of self-determination theory. More than 100 empirical studies on cognitive evaluation theory, as well as several meta-analyses, including one from Deci, Koestner, and Ryan (1999), provide sufficient evidence for the validity of the first mini-theory. Nevertheless, most studies focused on one-time external rewards and neglected repetitive exposure (Vansteenkiste, Niemic, & Soenens, 2010; Mouratidis, Vansteenkiste, Sideridis, & Lens, 2011).

Researchers empirically tested organismic integration theory in a vast number of different social contexts, usually with the use of self-reports, instead of experimental settings (Vansteenkiste, Niemic, & Soenens, 2010). The validating results support not only the theory itself but also underline the findings from studies regarding cognitive evaluation theory (Deci & Ryan, 2000).

The causality orientations theory builds on empirical research, conducted with the use of the General Causality Orientations scale (Deci & Ryan, 1985).

Van den Broeck, Ferris, Chang, and Rosen conducted a meta-analysis on satisfaction and dissatisfaction of the basic psychological needs in work contexts and largely confirmed their essential role in motivation (2016). Autonomy, relatedness, and competence positively correlate

with the task, creative, and proactive performance, as well as introjected, identified, and intrinsic motivation. They correlate negatively with external motivation.

Kasser and Ryan (1993; 1996) developed goal content theory from trying to clarify how financial success and personal growth are distinguished aspirations. Criticism arose regarding the lack of cultural differentiation between collective and individualistic cultures, but several studies were able to replicate the results in fifteen different cultures (Ryan, Chirkov, Little, & Deci, 1999; Kim, T, & H, 2003; Grouzet, et al., 2005; Vansteenkiste, et al., 2007).

Rigby and Ryan (2018) discuss the application of self-determination theory in employee development and introduce the motivational quality continuum, which spreads from lower motivational quality (amotivation, external pressure, internal pressure) to higher motivational quality (personal value, intrinsic motivation). The lower end of the spectrum is associated with low productivity, creativity, learning, satisfaction with compensation, commitment to values and values, and loyalty and trust, whereas the higher end is associated with the respective opposites (Rigby & Ryan, 2018, p. 137). The authors argue that most individuals do not experience just one quality of motivation, but it changes with different tasks and situations. Rigby and Ryan present a foundation for applying self-determination theory in an organizational setting but do not provide evidence for a corresponding application of the framework.

Transformational leadership may be an example of the application of self-determination theory in the field of organizational research (Sheldon, Turban, Brown, Barrick, & Judge, 2003). Those leaders are charismatic, motivate through inspiration, stimulate their followers intellectually, and lead through individualized consideration (Bass & Avolio, 1990). The generated internalized work-motivation may stem from the leadership as a contextual factor, which will result in enhanced satisfaction of the basic needs, and, therefore, higher job performance (Sheldon, Turban, Brown, Barrick, & Judge, 2003, p. 371). Furthermore, transformational leaders implement a vision in their organization, i.e., a focal goal towards which the organization strives and which provides a sense of identity (Northouse, 2016; Shamir, House, & Arthur, 1993). The meaning of the work gets connected towards a higher goal, where, au contraire, transactional leaders emphasize extrinsic rewards in a rational transactional sense. This example is only one of several from which it is possible to conclude that self-determination theory may find its appropriate application in organizational research.

3.3 SELF-DETERMINATION THEORY AND FEEDBACK

To motivate employees to show high-quality work engagement, both intrinsic and extrinsic motivation are required (Ryan & Deci, 2019). Ryan and Deci suggest that cognitive evaluation theory, organismic integration theory, basic psychological needs theory, causality orientations theory, and goal contents theory can explain how self-determination theory can be applied in organizations. Cognitive evaluation theory, organismic integration theory, and basic psychological needs are the three empirically tested cornerstones of self-determination theory's approach towards work motivation (Deci & Ryan, 2014; Ryan & Deci, 2017, p. 532). Optimal motivation for working environments results from internalized extrinsic motivation and intrinsic motivation, i.e., autonomous motivation (Ryan & Deci, 2017, pp. 533-535). Optimal motivation depends on the level of satisfaction of the basic psychological needs. That means, in practice, if managers and organizations support autonomy and a sense of purpose, employees will be able to internalize the value of their work efforts, which will lead to autonomous motivation (Ryan & Deci, 2017, pp. 538-539). Interestingly, pay has not shown to predict the satisfaction of the basic psychological needs, nor intrinsic motivation, while managerial support of autonomy predicts both.

For some employees, work as the source of income, self-realization, and personal satisfaction is the basis of flourishing. Nevertheless, many people experience lower well-being during their time at work due to a lower or no satisfaction of the need for autonomy, competence, or relatedness (Ryan, Berstein, & Brown, 2010). Doshi and McGregor (2015) score relative autonomy by assessing *total motivation* of employees, where intrinsic motivation and identification with the organization have a positive and introjected and extrinsic motivation a negative impact on the score. Doshi and McGregor found that corporations with higher scores of total motivation usually outperform their competitors with relatively lower total motivation scores.

For a long time, the “*tit-for-tat*”-point of view of motivation, fostered in the field of economics through principal-agent-theory (Jensen & Meckling, 1976), has shown to deliver short-term results indeed. Here, giving a reward in a way that it reciprocates task completion, which, in the long-run, will foster the employees' focus and crowd-out intrinsic motivation. As Deci (1971) has shown, monetary contingency-rewards for tasks that were initially intrinsically motivating will decrease intrinsic motivation. Nevertheless, the mechanics of crowding-out of intrinsic motivation are complex, as can be seen in Figure 7, which shows the impact of rewards on intrinsic motivation, built on the results of Deci, Koestner, and Ryan (1999). As the results

show, intrinsic and extrinsic motivation are not additive but interrelated (Kuvaas, Dysvik, & Buch, 2014).

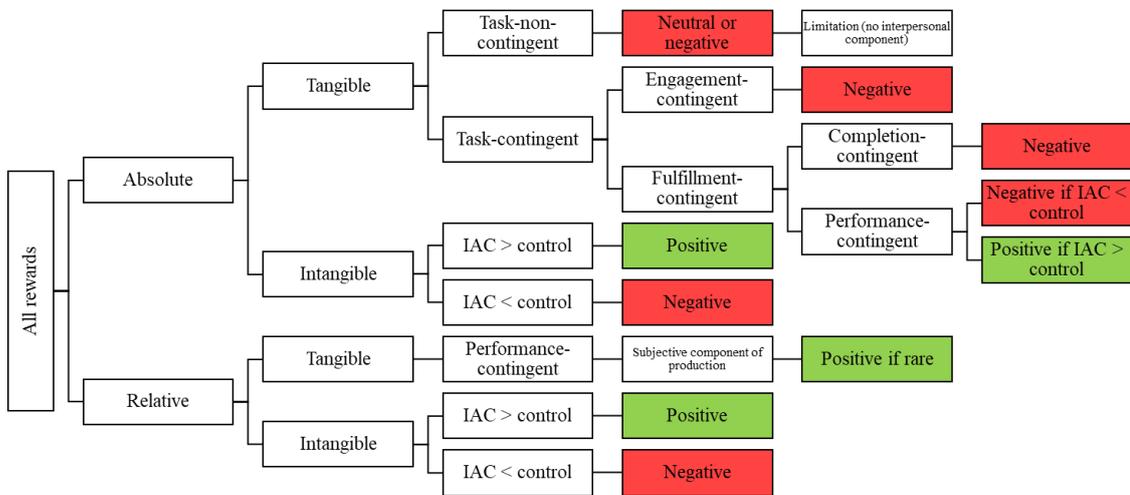


Figure 7 Crowding-Out (Deci, Koestner, and Ryan (1999), Klein & Walsken (2018))

Satisfying the basic psychological needs will enhance employee engagement, which has a positive impact on job performance, and, finally, will improve the employee’s well-being (Ryan & Deci, 2017, pp. 538-539). While organizations should improve how they promote employee equity and inclusion, managers can support need-satisfaction by providing employees with opportunities for choice, giving them the impression that their opinions are heard, and providing a meaningful impact on the employee’s competence.

Deci, Connell, and Ryan (1989) suggest that the following aspects comprise an autonomy-supportive leadership-style: the manager must be able to take the employee’s perspective, which includes emphasizing with their feeling and beliefs. At the same time, the manager must provide the employee with occasions for choice and deliver inputs to support their decision-making. Furthermore, managers must understand that rewards and punishment might lead to demotivational outcomes. Instead, they should provide verbal rewards, e.g., in the form of feedback that is positive and informative to support the perceived competence of the employee. Negative feedback, on the other hand, should be given within a process of supporting the employee in finding alternatives to their ineffective behavior, for instance, by encouraging exploration and self-initiative. Lastly, managers must understand how their communication-styles can affect motivation. In an economic analysis, Forest et al. (2014) found that the return on investment of an intervention to promote autonomy-supportive leadership is three to one, i.e., translating not only into enhanced employee well-being but also in economic savings.

One key-component of work is pay. Engagement- or performance-contingent, as well as relative pay, will harm perceived autonomy and competence, organizational equity and relatedness, and, finally, both work quality and quantity (Ryan & Deci, 2017, pp. 544-545). What is essential, is the functional significance of pay: it can have an informational significance, where the employee sees it as a satisfaction of the basic psychological needs, or a controlling significance, where the employee perceives it as pressure to think, act, feel, or behave a certain way. As outlined above, monetary rewards are not undermining intrinsic motivation, per se. While Deci et al. (1999) found that positive feedback enhances intrinsic motivation since it appraises competence, so can performance-contingent monetary rewards, if given within an autonomy-supportive social context (Ryan, Mims, & Koestner, 1983), i.e., the monetary reward has informational significance. Intrinsic, or autonomous motivation, which is tied to effective performance, is a predictor of performance. Nevertheless, pay-for-performance can still work in simple tasks with a low challenge (Weibel, Rost, & Osterloh, 2010).

Involving employees in decision-making processes and providing them with sufficient information, as well as using goal-setting approaches for evaluation systems, can support autonomy in both groups and individuals, as they may internalize goals and increase their commitment (Ryan & Deci, 2017, pp. 546-551). Feedback should be informational, negative feedback and decisions of managers should be supplied with rationales, following a problem-solving approach where employees formulate ways to improve, which is effectance-relevant and proactively motivating. The degree of challenge should be optimally set for the individual employee, and managers should acknowledge their employees' feelings and opinions.

The crucial point of providing positive feedback is that individuals will not perceive it as an external locus of control. An experimental study of Smith (1975) showed that individuals anticipating feedback (in this case, a written evaluation) following an interesting task would be less intrinsically motivated than peers without or with unexpected feedback, even though the feedback was positive. In a study by Ryan (1982), participants were provided with positive competence performance. However, positive feedback was conveyed in a way that would undermine their need for autonomy, e.g., by formulations like "*just as they should*" or "*as was expected*", to state an external locus of control. The participants showed significantly less intrinsic motivation despite receiving positive competence feedback. In a study set in a work organization, researchers found that participants perceived very salient feedback as controlling (Hewett & Conway, 2015). In conclusion, for feedback to enhance intrinsic motivation, it must confirm competence without undermining autonomy. Positive feedback is a verbal reward, and

in that sense, the terminology may already negatively influence the outcome, as “*rewards*” are usually an incentive for positive behavior, rather than a response (Ryan & Deci, 2017, pp. 152-153).

Cognitive evaluation theory argues that intrinsic motivation emerges when individuals are faced with optimally challenging tasks on which they can both exercise their abilities, as well as expand them in an autonomous setting. If individuals can find those challenges and pursue them, they can act in a constant mode of mastery, which positive feedback can enhance. Ryan & Deci distinguish two types of positive feedback: task-inherent feedback, and naturally occurring feedback (2017, pp. 154-155). Task-inherent feedback occurs in climbing a mountain, as individuals require no external source of feedback to measure their progressive success (Csikszentmihalyi, Abuhamdeh, & Nakamura, Flow, 2005). Natural positive feedback is less visible and harder to observe or judge, as, e.g., in the tedious acquisition of complex skills (Ryan & Deci, 2017, pp. 154-155). Individuals are likely to experience these two types of feedback as informational rather than controlling (Ryan, 1982). Other benefits of positive feedback are, e.g., higher vitality and levels of energy (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008), and enhanced levels of concentration during task-engagement (Grouzet, Vallerand, Thill, & Provencher, 2004).

Negative feedback, on the other hand, decreases intrinsic motivation since it usually diminishes the individual’s competence. Nevertheless, some studies suggest that the informational aspect of negative can be competence supportive (Carpentier & Mageau, 2013). A modest amount of negative feedback may be challenge-inducing: to facilitate intrinsic motivation, a task must be challenging, i.e., the individual must expect that failure could be possible. There are approaches to moderate the amotivating effect of negative feedback. Presenting the feedback in a highly controlling and pressuring way will lead to a stronger decrease in intrinsic motivation than change-oriented feedback from an autonomy-supportive authority (Mouratidis, Lens, & Vansteenkiste, 2010; Parcels, 2000). Besides the devastating impact on intrinsic motivation, receiving negative feedback could also mean that the individual has no control to achieve their desired outcomes, hence the decrease in extrinsic motivation (Ryan & Deci, 2017, pp. 156-157). The combined decrease of intrinsic and extrinsic motivation will result in a feeling of helplessness, especially if the feedback asserts the individual as incompetent (Abramson, Seligman, & Teasdale, 1978).

The implications of negative feedback are decisive for motivation. The guidelines for giving feedback above are focused on working relationships and autonomy; however,

abstracting them for general purposes and shedding light on competence provides an opportunity for diversified application. In general, to help individuals overcome obstacles, support in clearly identifying and acknowledging those obstacles supports perceived competence (Ryan & Deci, 2017, p. 448). Furthermore, it might be possible that the individual is not choosing optimal challenges, but potentially over- or undersetting their goals, which affects autonomous motivation. Forms of self-evaluation promote are causing an external locus of control, just as evaluation from others. Instead, progress should be measured in a self-informative way. Video games, for instance, provide several examples of goal-setting and feedback: in games with levels, individuals experience a confirmation of their competence with successful completion of goals and receive rewards in the form of more or better tools (Ryan & Deci, 2017, pp. 514-515). In games, the goals for level-completion are set intuitively, and increase in complexity with progressing mastery.

3.4 SELF-DETERMINATION THEORY AND INCENTIVES

The presented theories explain that performance can be influenced through intrinsic and extrinsic motivation. While a majority of the theories focus on educational settings, the emergence of agency theory (Jensen & Meckling, 1976) made a case for implementing motivational schemes in organizational settings⁷. The paradigm of using incentives as motivational factors has been equally followed in the fields of psychology and economics (Fall & Roussel, 2014).

Cognitive evaluation theory (Deci & Ryan, 1980) significantly profited from the work of de Charms (1968), as well as the motivation-hygiene theory (Herzberg, Mausner, & Snyderman, 1959). Herzberg's theory states that not all incentives have similar effects on employees, and therefore distinguish motivational and hygiene factors. Hygiene factors do not motivate in their presence but have a demotivating impact in their absence. Deci (1975) concluded that compensation is an extrinsic motivator, and, therefore, shifts the individual's perception toward an external locus of control, and restricts autonomy. This paradox opened the perspective for further research, and, finally resulted in the above-discussed distinction of extrinsic incentives. While compensation is an external reward, it can belong to the category of autonomous behavior, i.e., despite the compensation, the individual acts with a feeling of free choice (Deci & Ryan, 2008). Rewards can contribute to the satisfaction of the three basic psychological needs, depending on the individual's attribution towards these (Deci & Ryan,

⁷ A summary of the formal explanation for the requirement of incentives in organizational settings can be reviewed in Klein & Walsken (2018)

1985): when perceived as controlling or instruments of pressure, they diminish autonomy. However, when discerned as a validation of competence, they increase perceived competence, and, hence, intrinsic motivation (Fall & Roussel, 2014, p. 209). Performance-contingent pay may harm perceived autonomy since it shifts the locus of control. However, it may also enhance perceived competence as it provides performance information (Gagné & Forest, 2011).

Fall & Roussel (2014) conclude that motivation through compensation must stand in the context of organizational justice, i.e., self-determined motivation, compensation, and organizational justice, are codependent. They suggest that compensation plans should avoid evoking feelings of control, and foster perceived autonomy, e.g., through setting objectives in cooperation between subordinate and superior, and use skill-based incentives, as well as using compensation as a recognition of past performance, rather than bonuses which cover a set of unspecific goals. Group-based compensations have shown to increase perceived interpersonal control as group members may suspect free-riding behavior in each other. Individuals motivated by control and pressure may show increased extrinsic motivation through both individual- and group-compensation. Ex-ante rewards are based on control and show the same effect. The implication is a divergence between self-determination theory (Deci, 1975; Deci & Ryan, 1985) and principal-agent theory (Jensen & Meckling, 1976): whereas the one suggest that rewards and punishments will diminish intrinsic and autonomous motivation, the others see them as crucial to align interests of stakeholders. A study of Bénabou and Tirole (2003) showed that variable ex-ante compensation could be a “*penalty reward*” for uninteresting tasks or a lack of the principal’s confidence in the agent’s abilities, i.e., crowding-out of intrinsic motivation will occur. Ex-post rewards, on the other hand, can be part of the information asymmetry between principal and agent, where the principal possesses more information about the agent’s performance (Suvorov & van de Ven, 2006). The reward will not appear controlling but as an indirect measure of the agent’s performance, if proportional.

A principal wishing to use monetary incentives to increase performance, should make use of a bonus or an increase in salary for the recognition of contributions, which are not connected to ex-ante defined goals. The compensation should ideally be laid out to support the satisfaction of the basic psychological needs to avoid crowding-out effects.

3.5 SELF-DETERMINATION THEORY AND THRIVING

In a working environment, thriving may be defined as: “[...] *the joint experience of vitality and learning. It is a marker of individual growth and forward progress. As a result,*

thriving can serve as a kind of internal gauge that individuals can use to assess how they are doing in terms of their well-being at work.” (Spreitzer & Christine, 2014).

Thriving can be used as an internal source of feedback to provide individuals information about their personal growth and development, as opposed to feedback from others (Spreitzer & Christine, 2014, p. 248). Thus, they can adjust their behavior to achieve their goals more effectively. An individual can use self-tests to assess whether they are in a state of thriving (Porath, Spreitzer, Gibson, & Gernett, 2012), which include a learning-dimension, and a vitality-dimension. These dimensions assure distinction from just self-actualization, work engagement, or learning, and show consistency with self-determination theory in evaluation autonomy and growth. The self-assessment can be used as an addition to external sources of feedback (Porath, Spreitzer, Gibson, & Gernett, 2012).

Thriving can have profoundly positive feedback on job performance (Porath, Spreitzer, Gibson, & Gernett, 2012). Higher levels of thriving correlate with superior external performance evaluations, increased job commitment, high job satisfaction, and lower levels of burn-out. Furthermore, thriving individuals are showing more career development initiatives and leadership effectiveness.

According to self-determination theory, individuals are interested in complexifying their challenges and informing a coherent sense of self (Gagné & Deci, 2005). Intrinsically motivated individuals engaging in a task perceive it as less effortful, which increases vitality (energy available to the self from satisfying basic psychological needs (Deci & Ryan, 2000)) (Nix, Ryan, Manly, & Deci, 1999). Ryan and Deci (2008) state that in intrinsically motivated tasks, energy depletes at a slower rate as compared to imposed tasks, but thriving may regenerate energy.

3.6 DISCUSSION

Self-determination theory solves the problem surrounding the continuous development of theories and provides a sufficiently broad framework to integrate existing theories while being specific in the subsequent analysis of the mini-theories. One major flaw of self-determination theory, however, is the background in education research of the theory. While a large body of researchers applies the theory to all sorts of contexts, there is no specific understanding of how well the theory applies outside of education. Furthermore, but even within the context of education research, we observe that the theory lacks an explanation for the psychological

development of motivation, i.e., self-determination theory merely explains an as-is-status, and does not include a specific sub-theory regarding the emergence of to-be-statuses.

While the vast base of empirical evidence confirming parts of self-determination theory strengthens its foundation, it caused a crowding-out of qualitative research. In this light, the dichotomy of intrinsic and extrinsic motivation, for instance, might be overly definite. Generally, it should not appear counterintuitive that intrinsic and extrinsic aspirations or expected rewards could interact and cause motivating effects in their combination.

3.7 CONCLUSION

The unifying and integrative approach of self-determination theory enables more effective motivation research, as well as the continuous revision of theoretical cornerstones without the instant requirement for re-conception. The influence of theory is already evident in a wide range of research fields. Given the theories discussed in previous chapters and their conceptual interconnection, the emergence of self-determination theory appears to be a logical next step.

Ultimately, however, self-determination theory does not start the end of the development of motivation theories. The background in educational research, as well as the heavy reliance on quantitative research, are limitations of the theory, making further examination and analysis necessary. Hence, instead of seeing this theory in the same context as those we have already discussed in earlier chapters, we should interpret self-determination theory as an active framework that can guide, but must not limit, motivation research. However, it is safe to declare that the theory will dominate and guide the discourse for the nearer future. Therefore, it is essential for motivation researchers to orientate themselves to the framework, delimit themselves accordingly, or contribute to its further development. From now on, it will be more difficult to justify for what reasons entirely newly conceived theories of motivation will be justified in academic discourse. This is where the most considerable slowdown of the otherwise presumably accelerated motivation research lies: due to the position as the current top dog, other theoretical approaches are pushed into the background or disappear into research niches. An example would be flow theory, where it is questionable whether this theory can be incorporated into self-determination theory in the future, or whether it will continue to coexist as an independent theory.

4. NEUROSCIENCE AND MOTIVATION

4.1 TERMINOLOGIES AND CONCEPTS

Currently, self-determination theory is the most promising approach in motivation research to have a long-lasting impact, and, therefore, produce comparable results. While the universal application of the theory may still require more testing, one can convincingly argue that, among others, Rigby and Ryan (2018) confirmed the case for an application in organizational settings.

New frontiers in neuroscientific research enable testing of behavioral, i.e., psychological theories in an unprecedented manner. However, due to the tedious parallel development of research domains, neuroscientists are facing obstacles in investigating the neuroscientific foundation of motivation (Kim S. , 2013). Definitions and concepts of motivation often operate with different labels among groups of scholars – a result of the isolated fields of research (Murphy & Alexander, 2000; Pintrich, 1994). A majority of motivation researchers stem from pedagogical backgrounds or deduced experiments in educational settings (see above). As Murphy and Alexander state: “*Conceptual clarity is especially important to individuals who are endeavoring to overlay diverse traditions, each with its own phraseology and its own cadre of troublesome, but potent, constructs.*” (2000, p. 5). The boundary between cognition and motivation is blurred. Murphy and Alexander conducted a meta-analysis on terminations used in academic achievement and motivation; however, they included sources from physical journals outside of the field of education⁸, as well as any publication including keywords selected by a group of five experts (cf. Fig 1 in Murphy & Alexander, 2000). However, titles were dropped from the analysis if they would not contain both achievement and motivation

⁸ *American Psychologist, Journal of Personality and Social Psychology, Motivation and Emotion*

measures. The results show that not only the terminology is highly related to the general psychological study of motivation, but also that the field of academic achievement draws definitions from psychologists that were not explicitly focusing on pedagogy or education. A similar investigation is Conradi et al. (2014). Both studies provide an overview, but in essence, cannot guide future research other than suggesting to provide explicit or directly quoted definitions.

The solution to defining motivational terms lies in the intersection of neuroscientific research and the application of existing psychological theories: Murphy and Alexander, and Conradi et al. will never be able to reduce the existing definitions to a common denominator, as they grew from differing, sometimes even contradicting, theoretical foundations. Ultimately, grouping definitions into categories of principles could be possible, but the precision of coming research might suffer. Instead, research should focus on neuroscientifically testing modern motivational theories first, and then derive consequences for the terminology of motivation.

4.1.1 NEUROSCIENCE AND MOTIVATION: HOW NEUROSCIENCE INFORMS ON MOTIVATION

Motivation research faces many challenges, as discussed above. Neuroscience can provide insights in a simple experimental approach: if two settings testing different definitions result in two different ways of activation of parts of the brain, they may indeed be different. Vice versa, if settings testing two distinct approaches result in similar activity, we might be allowed to declare those definitions as interchangeable. Traditional approaches are limited in investigating how cognitive and affective processes are working, do, therefore, strictly speaking, not measure objectively (Kim S. , 2016).

However, brain imaging data merely shows the correlation between a task and brain activity, i.e., it is not observable if a motivational state is the result of brain activity or the other way around (Kim S. , 2016, p. 5). Furthermore, neuroscientists are facing the reverse inference challenge, i.e., a potential fallacy in the interpretation of what cognitive process is occurring given the observed brain activity (Polldrack, 2006; 2011). Also, the experimental settings in neuroscientific settings are even more limited than in other traditional settings, as the record of brain images endures only a few seconds (Kim S. , 2016, p. 5). Lastly, despite the technological advances in the last decades, image resolution is still limited.

In conclusion, while results from neuroscientific research do provide unique and novel insights, readers should take them with a grain of salt and stay updated with new developments.

4.1.2 MEASURING BRAIN ACTIVITY

An electroencephalogram (EEG) show differences in voltages between the different parts of the brain. While EEGs are easy to use and relatively cheap, they are limited to measuring cortical activity only (Piret, 2019; Kim S. , 2016, p. 7).

A positron emission tomography (PET) is a scanner that reads positron emissions when previously injected sugar decays, and monitors the flow of blood, oxygen, and glucose consumption in different areas of the brain, which correlate with brain activity (Piret, 2019). PET results in three-dimensional images and can reveal receptors or transporters of neurotransmitters. On the downside, PET requires the injection of radioactive liquids, which have a short half time (Piret, 2019).

Transcranial magnetic stimulation (TMS) uses pulses that arouse groups of neurons. TMS is the only method that solves the reverse inference problem, as it allows the observation of causality instead of correlation (Piret, 2019). TMS allows temporal stimulation without causing lasting damage; however, research is still ongoing on the precise functioning.

The most widespread technique is magnetic resonance imaging (MRI), which creates high-resolution images with magnetic fields and radio waves which manipulate the spin of hydrogen protons. MRI requires no radioactive fluid and can detect water content, inflammation, and bleeding in or of the brain (Piret, 2019). MRI only provides the structures, but not the functions of the brain. Functional magnetic resonance imaging (fMRI), on the other hand, allows for registering the magnetic properties of oxygenated and deoxygenated hemoglobin, therefore, showing blood flow (Piret, 2019; Kim S. , 2016, p. 6). While it allows researchers to see activation with higher spatial and temporal resolution than PET, it cannot trace neurotransmission.

4.1.3 BRAIN AREAS RELEVANT FOR MOTIVATION RESEARCH

Kim (2016) suggests that the following thirteen structures of the brain are interesting for the research of motivation (cf. Table 1). First, the prefrontal cortex (PFC), part of the frontal cortex, which is at the upper front of the brain. The PFC makes up more than 10% of the total volume of the brain (McBride, E, & Gur, 1999), and serves a large number of functions (The Science of Psychotherapy, 2017), as, e.g., the consciousness, deliberate goals, cognitive interpretations, and appraisal (Kim S. , 2016). The orbitofrontal cortex (OFC) is the part of the prefrontal cortex which lies above the eyes. It is highly involved in cognitive processes that involve value-related information (decision-making). The location of the ventromedial

prefrontal cortex (vmPFC) is at the bottom of the cerebral hemispheres and involved in the regulation of emotions and social contexts (The Science of Psychotherapy, 2017; Kim S. , 2016). The dorsolateral prefrontal cortex (DLPFC) is the center of cognitive control. The anterior cingulate cortex (ACG) plays a role in autonomic functions, but also the allocation of attention (Pardo, Pardo, Janer, & E, 1990), the anticipation of rewards (Bush, et al., 2001), ethics (Sevinc, Gurvit, & Spreng, 2017; Decety & Jackson, 2004), and impulse control (Hewitt, 2013). A significant component of the human brain, the hippocampus, plays a substantial role in the storage of long-term memories. The anterior insular cortex (AIC) plays a role in recognizing changes in the body (homeostasis). The caudate nucleus, putamen, and nucleus accumbens (NAcc) are parts of the striatum. The location of the striatum is deep within the cortical brain and plays a central role in the reward system of the brain (Kim S. , 2016). The ventral tegmental area (VTA) produces dopamine, a neurotransmitter that stimulates the reward system. Individuals learn the value of rewards of environmental objects through the activation of the VTA-to-striatum pathway (Kim S. , 2016, p. 9). Dopamine is a hormone that increases the heart rate and blood pressure and plays an essential role in behavior, cognition, voluntary movement, motivation, punishment, reward, sleep, mood, attention, working memory, and learning (Piret, 2019). While hormones do have an impact on the probability of the display of particular behavior, they do not directly cause it. The hypothalamus contains several nuclei that drive biological motivation and regulate the hormonal and nervous system. The amygdalae are two almond-shaped clusters of nuclei and play significant roles in processing memories and emotional responses (Amunts, et al., 2005).

Table 1 Overview of Brain Structures, Their Motivational Relevant Functions, and Circuits

Structure	Functions	Circuit
Prefrontal Cortex (PFC)	Consciousness, deliberate goals, cognitive interpretations and appraisals	
Orbitofrontal Cortex (OFC)	Processing and storage of value-related information about environmental objects	VALUATION
Ventromedial Prefrontal Cortex (vmPFC)	Processing and storage of affect-based information associated with sensory and social stimuli	VALUATION
Dorsolateral Prefrontal Cortex (DLPFC)	Retaining of goals, cognitive control	SELF-REGULATION
Anterior Cingulate Cortex (ACG)	Monitoring of conflicts in information processing, allocation of cognitive resources in case of conflict	VALUATION, SELF-REGULATION
Hippocampus	Storage of long-term memory information (especially facts or events)	
Anterior Insular Cortex (AIC)	Monitoring and recognition of changes in bodily states to generate subjective feelings	
Striatum Dorsal part (caudate nucleus, and putamen)	Major part of brain reward center, hedonic evaluation of environmental stimuli	REWARD
Striatum Ventral part (nucleus accumbens (NaCC))	Major part of brain reward center, hedonic evaluation of environmental stimuli	REWARD
Ventral Tegmental Area (VTA)	Producing dopamine	REWARD
Hypothalamus	Biological motivation (hunger, thirst...), regulation of endocrine (hormonal) and nervous (arousal) system	
Amygdala	Detection, learning, and reaction to emotionally significant and aversive events (intense negative feelings, defense)	REWARD, VALUATION

4.2 SYNTHESIS OF CONCEPTS IN MOTIVATION RESEARCH AND NEUROLOGY

Historically speaking, the research overlap of psychologists and neurologists is small (Bindra, 1985). One example where neuroscientific research results changed existing theories in psychology is Miller's highly cited paper on short term memory (Reeve & Lee, 2012, p. 2). In essence, the cognitive psychologist argued that, on average, humans are capable of holding seven (\pm two) items in their short-term memory (STM) (Miller G. A., 1956; Cowan, 2015), describing the natural limitations of hippocampal STM, which influenced educational psychologists to revise their approaches on learning theories. This chapter attempts to compare research approaches from neurologists and psychologists towards the same concepts. Reeve and Lee (2012) did so by discussing the terms agency, volition, value, intrinsic and extrinsic motivation, flow, expectancy, self-efficacy, and self-regulation and goals. The discussion of those elements in this order disorients the non-interdisciplinary reader: flow is a standalone theory, and not a widely used term in several motivation theories. Self-regulation can work through goal-setting (Laranjo, 2016), but describes the overall reflective process of intention and completion for energy-regulation. Murphy and Alexander (2000) conducted a corpus of twenty motivation terms relevant to academic achievement and motivation. While the

researchers explicitly mention the relation to education research, the corpus may apply to motivation research in general. Figure 8 displays an adaption of the framework from Murphy and Alexander, excluding social goals, interest, and work avoidance goals, as those are not necessarily prevalent in motivation research, as the previous chapters demonstrated.

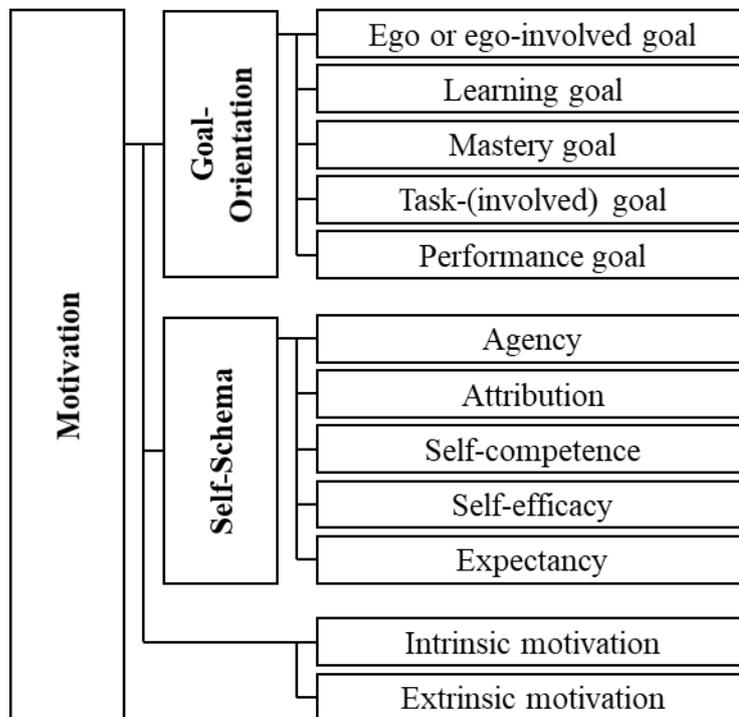


Figure 8 Corpus of Motivation Terms Adapted from Murphy and Alexander (2000)

4.2.1 GOAL-ORIENTATION AND INFLUENCERS OF EXPECTANCY

Reeve and Lee (2012, pp. 366-368) describe motivated action as the result of goal-directed effort, and state that the extraction of reward-related information works through the release of dopamine (Berridge & Kringelbach, 2008). Dopamine is erroneously known as the hormone of happiness, but evidence points at its importance in the valuation of pleasure and the resulting level of effort or behavioral activation (Salamone & Mercè, 2012; Salamone, 2012).

In terms of motivation research, expectancy and value are crucial determinants of motivation: dopamine-centric reward-based motivation is the neurological explanation. While the sensation of the reward takes place in subcortical brain structures, the valuation takes place in cortical brain structures, as well as the storage of reward-related information. These structures activate the dopamine system, i.e., the ventral tegmental area for production and release of dopamine, to which the ventral striatum and nucleus accumbens respond. Finally, the

basal ganglia prepare the resulting motoric action. Table 1 presents several structures that play a role in motivation. Not for every motivational state, all areas are active: their activation relates to the different types of motivation. Natural or automatic states of motivation, as Reeve and Lee (2012, pp. 368-370) label them, relate to homeostatic and hedonic motivation as, e.g., for the consumption of food or water and are monitored and regulated by subcortical limbic structures (Saper, Chou, & Elmquist, 2002) – less by dopamine-centric structures. A natural state of motivation should end with the restating the equilibrium, yet, it does not fully explain why people prefer some drinks over others. Ramsay and Booth (1991) showed that fluid intake has the properties of positive rewards. For instance, the temperature may be more appealing depending on the environment, and ingredients like caffeine or alcohol may make one drink more appealing over another: the more significant the thirst, the more the motivation state is natural, and the less important become aspects as temperature or taste. The orbitofrontal cortex and amygdala respond to the rewarding properties of the drink, forwarding the reward-related information to the striatum, i.e., the dopamine-centric reward system. As we can see, there is a neurological basis of different types of motivation, and their activation may depend on environmental circumstances.

Reeve and Lee discuss associative learning as behavior acquired through experiencing the rewarding properties of environmental incentives (2012, pp. 369-371). The associative learning process into associative or cognitive learning, affect from liking or conscious pleasure, and implicit or cognitive motivation (Berridge, 2004). As we know from daily experience, there may be a divergence between affect und motivation: in natural circumstances, wanting and liking is usually given, but we may want to smoke, even though we do not enjoy the taste. Litman's integrative interest-deprivation theory of curiosity states that for resolving conflicts of the neurobiological systems of liking and wanting, higher cognitive processes are required (2005).

Mild positive feelings may influence cognitive processes through the activation of dopamine neurons in the ventral tegmental area, and from there to cortical areas. This observation is called the dopamine hypothesis of positive affect (Ashby, Valentin, & Turken, 2002). It has shown that mild positive feelings correlate with creative problem solving (Isen, Daubman, & Nowicki, 1987), recall of neutral and positive material (Isen, Shalcker, Clark, & Karp, 1978), and changes decision-making strategies (Carnevale & Isen, 1986), through the projection of dopamine in the prefrontal cortex and anterior cingulate cortex. It is crucial to note that positive feelings must be mild and unconscious. As soon as an individual consciously

experience their affect, the positive effects perish. Reeve and Lee suggest that the positive affect of liking might be epiphenomenal and that indeed it is the increase of dopamine, rather than the affect itself, which causes the positive effects (2012, pp. 370-371). Considering the findings of Salamone and Mercè from the same year regarding the impact of dopamine on reward expectancy (Salamone & Mercè, *The Mysterious Motivational Functions of Mesolimbic Dopamine*, 2012), we can see the dopamine hypothesis of affect in another light: from being the source of positive feelings, it becomes the moderator.

Simpson and Balsam (2015) suggest influencing factors and processes involved in motivation, which heavily borrows from expectancy and goal-orientation theory. They place cost-benefit analysis at the core of motivation. They argue that costs (e.g., effort, time, discomfort) and benefits (e.g., meeting physiological and psychological needs) are evaluated, encoded, learned, and retrieved depending on the current physiological state, the environment, and prior experience. This process illustrates the evaluating role of dopamine in motivation: a mildly positive physiological state influences the valuation of benefits (higher) and costs (lower). The somatic marker hypothesis explains that emotional processes may influence motivation through conditioning (Damasio, Tranel, & Damasio, 1991). Physiological changes (somatic markers) transform into emotion and, therefore, information for the individual about a stimulus. Through repetition, the individual associates the somatic markers with past experiences and their outcomes.

So far, we have discussed direct reactions of the brain to environmental changes or rewards. Rewards lie at the core of motivated behavior, and while unexpected rewards may result in positive feelings, and, therefore, changes in the expectancy of outcomes, expected rewards always contain a time-component. The brain continually attempts to predict the future, e.g., by using analogies to similar situations (comparison of situational input to memory) (Bar, 2009). Individuals use memories to forecast the future to prepare for it – that means, they use previously learned information to execute motivated behavior to achieve the desired outcome, or, a goal (Klein, Robertson, & Delton, 2010; Sitzman, Rhodes, & Kornell, 2016).

4.2.2 AGENCY

Reeve and Lee describe agency on the example of agency as discussed by Bandura (1989) that neuroscientists focus on self-as-a-cause versus other-as-a-cause (2012, pp. 372-373). The similarity to the concept of the locus of control, as discussed by deCharms (1983), in attribution theory by Weiner (1972; 1991) and in cognitive evaluation theory (Deci & Ryan, 1980), is striking. Neurological studies suggest that agency depends on and is interrelated with the

supplemental and presupplemental motor area, i.e., for an individual, agency is the connection of cause and effect (Farrer, et al., 2003; Rohde & Ernst, 2016; Haggard, 2017). So, in neuroscience, researchers speak of “*low*” agency, if the locus of control is externally, and of “*high*” agency, if it is internally. We can confirm that both neurological and motivation research discusses an identical phenomenon and come to similar conclusions: if an individual perceives an external locus of control, they have less incentive to act.

However, this conclusion could be too short-sighted. Suppose we are driving along a narrow inner-city street, and an ambulance with flashing lights and sirens is trying to overtake. The locus of control to pull over and make way is external because we understand the visual and acoustic signals as a warning to clear the way. The benevolent citizen would do what is right and pull over – but a disturbingly high number of people would refrain from doing so (Schmidt & Feltes, 2012). Here, the concept of volition (Haggard, 2008) may expand motivation research: neuroscientists investigate mental control in terms of an individual’s freedom to act. Their findings show that voluntary actions are activating motor-related brain regions (as discussed above), and cognitive conflicts (e.g., through monitoring) activate the dorsal anterior cingulate cortex. We could understand agency as the initiation of an action and volition as the repetition of it over time (Reeve & Lee, 2012, p. 373), but the neuroscientific concept may conflict with the study of intrinsic motivation. An early study of volition gave participants the freedom to choose the time for a simple manual movement and resulted in the discovery of “*readiness potential*”, which started on average 635ms and became conscious about 200ms before an action (Libet, Gleason, Writh, & Pearl, 1983). The set-up deviates from experimental set-ups in motivation research of intrinsic motivation, as, e.g., Deci, Koestner, and Ryan (1999), in one major point: participants were not free to act itself, but only decide about the point of time. Translating the two experimental studies into work organizations, Libet et al. are capturing real-life circumstances in a better way than Deci, Koestner, and Ryan. While self-determination theory underlines the importance of autonomy in work organizations, the tasks of employees are usually pre-defined and not subject to significant individual influence. Nevertheless, employees might be able to choose the point of time when to perform an action – just as in the setting of Libet, Gleason, Writh, and Pearl (1983).

Duffy, Jadidian, Douglass, and Allan (2015) define volition as “[...] *the perceived capacity to make occupational choices despite constraints* [...]” and argue that the locus of control alludes to more global feelings, instead of specific decision-making. This definition aligns with Weiner’s definition of the locus of control (focus on attribution of success and

failure) (1991). Duffy, Jadidian, Douglass, and Allan found that an internal locus of control mediates work volition (2015), and, therefore, measuring work volition adds to the prediction of job satisfaction (Duffy, Diemer, Perry, Laurenzi, & Torrey, 2012).

To conclude, volition is not equal to the locus of control and may have been, especially in work-related applications, be studied with experimental settings depicting free-will more accurately than in studies investigating intrinsic motivation. Measurements of the locus of control may be useful indicators of work volition. Furthermore, volition adds to self-determination theory by providing a higher resolution of the picture of autonomy. Currently, autonomy, one of the basic psychological needs, is defined through the individual's perception of their autonomy: measuring the locus of control and volition provides more insights towards the general sense of autonomy (and thereby intrinsic motivation) of the individual and their perceived autonomy in decision-making processes.

3.2.3 EXPECTANCY

Neuroscience discusses expectancy in the context of rewards, i.e., how expected a reward is (Reeve & Lee, 2012, pp. 375-376). As discussed above, individuals continuously predict the future, which will inevitably lead to erroneous predictions. The reward prediction error hypothesis lies at the core of Pavlov's conditioning and Thorndike's Law of Effect (Schultz, 2016; Rescorla & Wagner, 1972): through learning, an individual develops an expectancy that particular behavior will lead to a reward. If the prediction equals the reward, the prediction remains unchanged. However, if the prediction does not match the reward, it will be updated: in that case, the reward surpasses the prediction (positive prediction error), the next prediction will be more precise, and the behavior gets repeated. If the reward is less than prediction (negative prediction error), the individual might execute less of the behavior in the future – we learn from our mistakes. This process takes place in the reward circuit of the brain (striatum, frontal cortex, amygdala) in connection with dopamine neurons, which signal rewards and reward-predicting stimuli (Schultz, 2016; 1986). The dopamine neurons activation corresponds to the negative and positive prediction error, i.e., not to any reward, but only if there is prediction deviation. A positive prediction error leads to a positive dopamine response, no error to no response, and a negative prediction error to a negative response (Schultz, 1986; Schultz, Dayan, & Montague, 1997). With an increased delay between prediction and reward, the dopamine response decreases (cf. 2.5 Respondent Conditioning (1897)). Studies have shown that risky rewards exhibit stronger dopamine responses than safe rewards (Stauffer, Lak, & Schultz, 2014). These results can be used to reflect marginal utility in economic derivations of

risk-preferences and decision-making. To sum up, the reward prediction error hypothesis is a strong contender for the explanation of dopamine-centric reward-based learning through expectancy and provides a neuroscientific foundation for all motivation theories based on outcome expectancy.

4.2.4 SELF-EFFICACY

According to Reeve and Lee, the precuneus in the parietal lobe handles self-related imagery, episodic memory retrieval, preparation of future action, and experience of agency (Reeve & Lee, 2012, p. 376). For an individual to assess their self-efficacy, past experiences of task mastery (cognitive and motoric skill) are required. Individuals with higher skill-levels can focus on the larger goal of their task, instead of the respective goal-directed steps (Gobel, Parrish, & Reber, 2011; Fincham & Anderson, 2006). Self-efficacy is relevant for adequate allocation of energy, i.e., for choosing an appropriate level of effort for goal-completion.

4.2.5 INTRINSIC MOTIVATION

Di Domenico and Ryan state that: “[...] *the concept of intrinsically motivated exploration is consistent with the ‘affective neuroethological’ perspective of Panksepp and colleagues [...]*” (Ryan & Di Domenico, 2016; Di Domenico & Ryan, 2017), who discuss a hardwired general-purpose “*seeking system*” which provides energy for exploratory actions. This system does not seem to equilibrate homeostatic imbalances but maintains curiosity towards the environment, i.e., an “*objectless appetitive system*” (Di Domenico & Ryan, 2017). The reward circuit lies at the core of this system. Di Domenico and Ryan declare that the results from neuroscience and organismic principles from self-determination theory are converging (2017). The existence of a neurological seeking system feeds into the explanation of not only intrinsic motivation but also flow (Csikszentmihalyi, 1990): a neural foundation of the natural autotelic behavior. Dissatisfied with the limited explanatory power of drive theories, the optimal incongruity-perspective, and competence approaches, Loewenstein (1994) discusses how awareness of specific lack of knowledge or information creates a strong desire to fill the gaps, i.e., curiosity as a universal motive for information acquisition (Golman & Loewenstein, 2018). The concept of information-gaps corresponds to what self-determination theory labels “*competence*”.

The specific study of intrinsic motivation in neuroscience is challenging and may be subject to type I and type II errors (Di Domenico & Ryan, 2017; Reeve & Lee, 2012). Nevertheless, in line with the dopamine-centric approach to rewards, several findings indicate dopamine as a critical substrate of intrinsic motivation. The studies of Panksepp and colleagues

understand dopamine as the core of the “*seeking system*”. Furthermore, as discussed in the context of the dopamine hypothesis of positive affect, the neurotransmitter is associated with explorative behavior in new circumstances (DeYoung, 2013), and reflects associative learning through “wanting” (Berridge, 2004). De Dominic and Ryan explain that people with frequent exposure to intrinsically motivated flow states possess higher availability of dopamine D2-receptors in striatal brain regions, especially in the putamen.

4.2.6 EXTRINSIC MOTIVATION

Neuroscience research set extrinsic motivation equal to incentive motivation, i.e., associative learning (see above). The valuation circuit, i.e., the OFC shows high activity in extrinsically motivated individuals for the assessment of the offered incentive, as well as in the greater ACG to decide whether the cost of the activity will be worth the benefit (Berridge, 2004; Cardinal, Parkinson, Hall, & Everitt, 2002; Lee, Reeve, Xue, & Xiong, 2012).

4.2.7 INTERMEDIARY CONCLUSION

Apart from motivation research, neurologists currently investigate overarching concepts, rather than differentiated applications. Behavioral research, especially during the high times of Behaviorism, is characterized by “*black-box*”-research, i.e., the observation of in- and output, for instance, in experimental set-ups, but not necessarily the actual process between in-and output (Araiba, 2019). Neurological research observes the process and develops approaches based on similar neurological reactions, rather than the behavioral outputs. Therefore, we can see that in neuroscience, several subject areas consolidate.

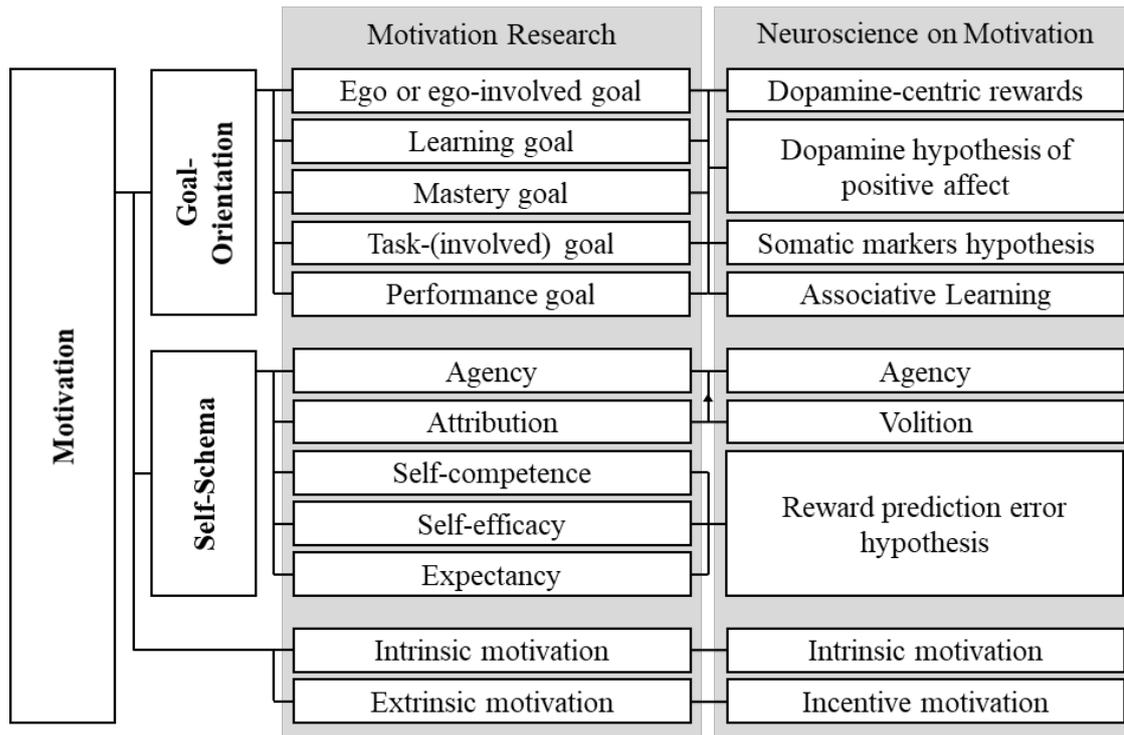


Figure 9 Conceptual Comparison of Motivation Research and Neuroscience on Motivation

Comparing the overview to the corpus of motivational terms in Figure 9, we may conclude that understanding goal-orientation does not necessarily require distinguishing the types of goals and that the differentiation should occur on another level of analysis. The same observation holds for the study of the self-schema: in neuroscience, agency is mostly discussed as understood in motivation research as the locus of control. The concepts of attribution may become redundant, as neuroscientists investigated the concept of volition, which offers a well-researched and improved perspective on the overall motivated decision-making-process of individuals. Volition is a prime example of the benefits of a more interdisciplinary approach to motivation between neurology and psychology. Self-efficacy and self-competence are crucial concepts in motivation research, but in neuroscience, their utility focusses on an improved prediction of the future, i.e., enrichment of information to chose optimal levels of effort. Extrinsic motivation, as discussed in motivation research, is mostly congruent to the findings in terms of incentive motivation in neurology, resulting in the concept of associative learning. Here, the potential for mutual leverage of concepts or approaches might be limited. The opposite holds for intrinsic motivation: several findings hint at a common denominator of intrinsic motivation and flow theory. In summary, the research streams are not as diverging as they appear to be, and, most importantly, no fundamental discrepancies in findings exist. Neurology supports “de-cluttering” motivation research, as well as the congruence towards one comprehensive theory of motivation.

4.3 NOVEL PERSPECTIVES ON TASK DIFFICULTY, EFFORT, AND MOTIVATION POTENTIAL

In the chapter on attribution theory, we have discussed that the self-perception of an individual's task-mastery influences the chosen level of effort (Thompson, 2019; Grant, 2008). Festinger explained how task success or failure would influence future engagement with the same task, e.g., by adapting effort (1957). The principle of optimal incongruity suggests that for given degrees of incongruity, a corresponding level of motivation exists, which sufficiently energizes the individual to achieve congruence (Hunt, 1965). Brehm and Self (1989) expanded on this approach by the argument that an optimal level of motivation supports the ideal use of resources. Therefore, we assume that individuals will only increase their level of effort if the cost yields a higher benefit (cf. Simpson & Balsam (2015)) (Gendolla, Wright, & Richter, 2012, p. 420). Brehm and Self argue that if the cost-benefit analysis yields positive marginal returns, the effort will increase respectively to difficulty – up until a point, the analysis yields zero or negative marginal returns, i.e., mastering the task would imply too high effort (1989). Consequently, if the potential benefit is low, the chosen level of effort will be low, too. Autonomic cardiovascular arousal correlates with emotional behavior and cognitive effort (Crtichley, Corfield, Changler, Mathias, & Dolan, 2000); therefore, Gendolla and Richter used cardiovascular studies to investigate the impact of incentives (2009).

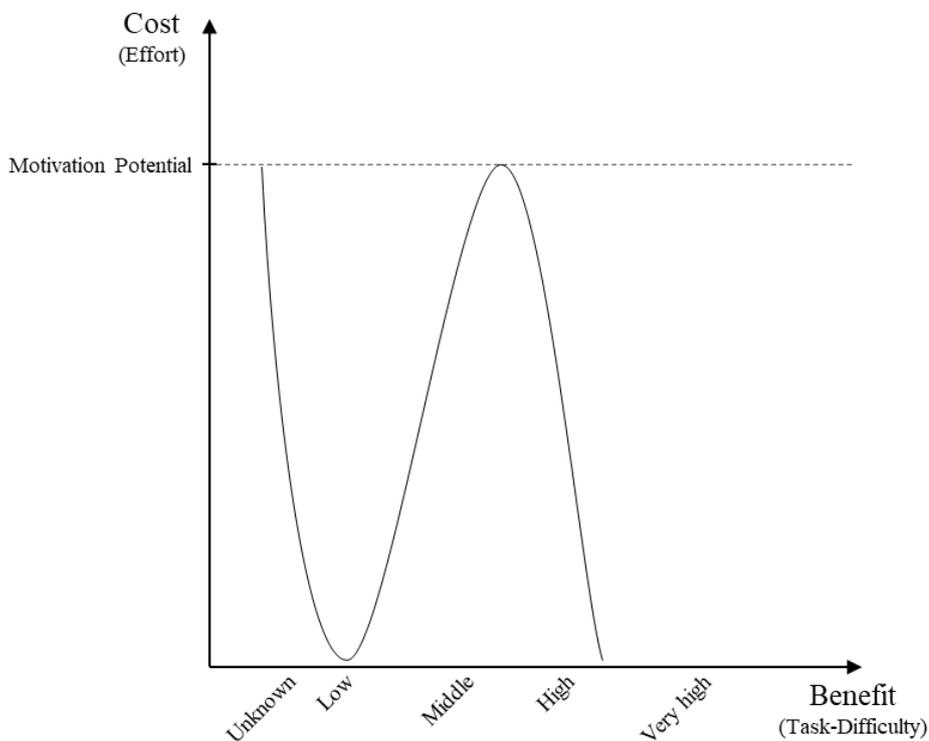


Figure 10 Optimal Degree of Effort for Benefit, (cf. Gendolla & Richter (2010))

Figure 10 shows the optimal level of effort given high stakes: the motivation potential is high. In tasks with lower stakes, motivation potential is lower, and the level of effort would shift to the left, i.e., reach its peak at middle task-difficulty (Gendolla & Richter, 2010). If the task-difficulty is unknown, individuals might execute the motivation potential to its full extent, if they understand that action is required. The situation equals “do-your-best” tasks, i.e., individuals are not made aware of which behavior will lead to success (cf. 2.14 Goal-Setting Theory (1984)).

A cardiovascular study by Eubanks, Wright, and Williams (2002) showed that high monetary incentives are resulting in a higher effort for a difficult task (i.e., as graphically represented in Figure 10), and with low task difficulty, high incentives do not increase effort, as the low level of effort is already sufficient for success. As cardiovascular reactions are indicators for cognitive effort, we may interpret these findings as biological evidence for the concept of optimal incongruity, while not identically to the adaption of Harter (1974) (cf. Figure 1).

The mood-behavior-model (MBM), as proposed by Gendolla (2000), integrates empirical evidence from investigations of the influence of moods on behavior. Moods can either have informational effects, as, e.g., judgments or appraisals, or influence preferences and interests. Moods are not motivational states per se but can influence effort when they provide task-relevant information, especially for tasks with achievement-goals that require task difficulty prediction (Gendolla, Wright, & Richter, 2012, p. 426). Apart from moods, expected social evaluation of an individual’s performance (Wright, Tunstall, Williams, Goodwin, & Harmon-Jones, 1995), an increased sense of success importance (high ego-involvement) (Klein & Schoenfeld, 1941), and self-evaluation influence the motivation potential (Gendolla, Richter, & Silvia, 2008).

4.3.1 MOODS AND MOTIVATION POTENTIAL

Moods can indicate physiological and psychological functioning (Thayer, 2012), and significantly influence pleasure, making them “[...] *more important than daily activities, money, status, and even personal relationships* [...]” (Thayer, 1997, p. 4). The influencing effect works indirectly through the impact of moods on the self-perception of energetic potential (Backer, Frith, & Dolan, 1997). A lack of energy, i.e., tiredness, can lead to an overestimation of the required energy for performing a task (Thayer, 1987). The connection of moods to thought and cognitive processes makes them capable of affecting behavior and motivation, where favorable moods base on high levels of energy and low tension, vice versa for

unfavorable moods (Thayer, 2012, p. 408). Energetic arousal, a biopsychological variable depending on the level of arousal and energy (cf. Table 2), i.e., when energy is high, motivation is high, too, and varies with the circadian cycle (Thayer, 2012, p. 409).

Table 2 Complex Moods Derived from Biopsychological Dimensions (cf. Thayer (2001))

		Arousal	
		Calm	Tense
Energy	Energetic	Calm Energy	Tense Energy
	Tired	Calm Tiredness	Tense Tiredness

Thayer suggests that tense energy only rises until it reaches a moderate level of arousal and energy, and as soon as the tense arousal increases further, it will decrease energetic arousal, yielding intense tiredness (2012, pp. 413-414). That means, there is a positive correlation from low to moderate activation, and a negative correlation for high activation, merging into orthogonal dimensions. The correlations do not change if the activating conditions result in calm energy or tense tiredness. If energy further increases while arousal diminishes, exhaustion occurs, and the behavior lacks subjective feedback about energy sources, possibly resulting in a physical breakdown (Thayer, 2012, p. 413; Pollak & Hart, 2017).

Subjective feedback generated by loops is a part of the cybernetic feedback control system (Carver & Scheier, 2012). The cybernetic feedback control system functions similarly to the reward prediction error hypothesis: one feedback loop is divided into an input function, a reference, a process of comparison, and an output (MacKay, 1965; Miller, Galanter, & Pribram, 1960; Powers, 1974). The input is the individuals' perception and provides circumstantial (perceived) input. A reference can be a value or goal, to which input gets compared and evaluated in terms of deviations. Carver and Scheier explain that depending on the complexity of a goal, it may be subdivided into narrower goals, which will feed into the achievement of the overarching goal, resulting in a hierarchy of processes (2012, pp. 31-33). Achieving the narrower defined goals can feed into a more precise definition of the abstract goal. According to Powers (1973), simple actions as picking up a pen to sign a contract are "sequences", whereas signing a contract for leasing a minivan to start a business is called a "program", which includes planned strings of actions. Programs may be subject to guiding principles, which are the decision-making basis

for within-program choices (Carver & Scheier, 2012, p. 31). In this hierarchy, feedback control loops at the higher levels determine the references for the next lower-level loops, i.e., to change the output at the lowest level (muscle tensions), all the above levels must be involved. Evidently, due to the complex involvement of an individual's psychology, the current affect may significantly change the process: depending on current affect, references could be picked differently, and, therefore, engage with the overall goal-achievement process.

In the following, we will discuss that and how complex moods substantially impact motivation, as discussed by Thayer (2012, pp. 414-415). Calm energy might be optimal for cognitive and physical activity and usually occurs during waking hours. It is suggested that calm energy is an ideal prerequisite for the experience of flow, as it enables pleasurable attentional focus (Csikszentmihalyi, 1990). On the contrary, tense tiredness, which usually occurs if experiencing stress in the late afternoon or late evening, is a mixture of an alert state of behavior, in combination with a lack of energetic resources, leaving the individual vulnerable for increased feelings of depression and pessimism about the future. Tense energy is similar to tense tiredness, but the individual possesses the required energy for task-fulfillment, leading to high-energy productivity, but without a sense of relaxation. Calm tiredness is ideal for sleep, but also experienced in depression or with emotions like happiness, anger, or boredom, and related to optimism. In contrary to tense tiredness, calm tiredness leaves the individual optimistic about the future and their prediction of the required energy for activities.

4.3.2 COMPLEX MOODS DETERMINE EFFORT VIA EXPECTANCY

The results of Thayer regarding optimal complex moods showcase striking similarity to the concept of optimal task-difficulty, as discussed by Gendolla and Richter (2010). In essence, just as medium perceived task difficulty leads to highest motivation potential, medium arousal in combination with high energy will lead to the highest motivation potential, and an increase of arousal decreases energy, diminishing the motivation potential. In the context of optimal incongruity, while profoundly altered and adapted, we observe confirmation that an optimal state of motivation arises with adequate energy to medium arousal, and find evidence for aspects of VIE-theory (Vroom, 1964).

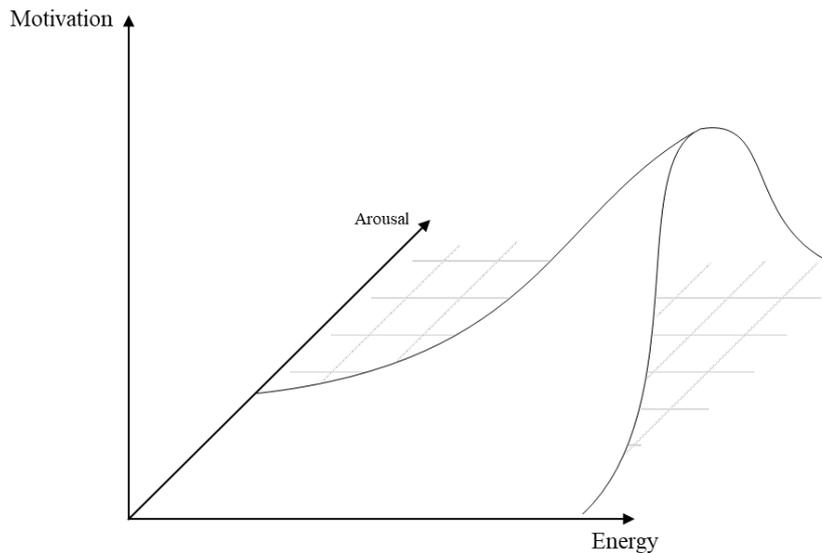


Figure 11 Motivation Potential Derived from Complex Moods

Figure 11 illustrates the optimal combinations of arousal and energy for producing the highest motivation potential. As complex moods indirectly influence perceived ability, and perceived ability crucially impacts an adequate prediction of required effort, we can conclude that complex moods influence effort, and, therefore, motivation potential.

Complex moods provide a compelling unification for the understanding of different levels of effort with a biological foundation, which joints a variety of psychological approaches, as, e.g., attribution theory. We can confirm that self-efficacy, self-competence, and expectancy do play a vital role in the determination of effort through their influence in the prediction of required task effort. Neurologically, the reward prediction error hypothesis stands in direct context of these observations, whereas complex moods allow an explanation for remaining unexplained variance.

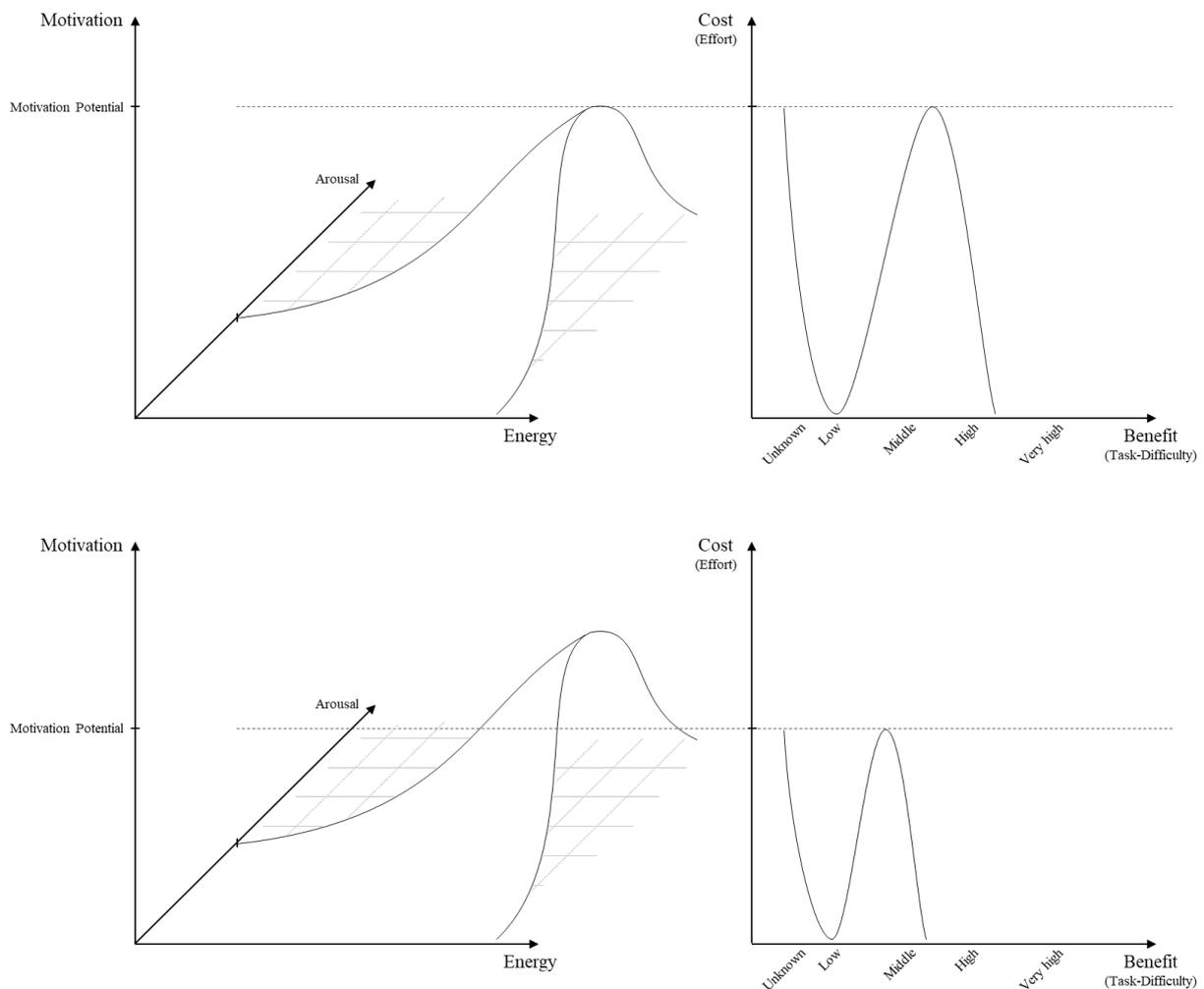


Figure 12 Derivation of Motivation Potential Through Complex Moods

In Figure 12, we can see the combined functioning of complex moods on the derivation of motivation potential and the subsequent impact on the chosen level of effort for given task difficulty. If energy is low, motivation potential will fall, and the inverted parable in the right-hand chart will shift to the left, as suggested by Gendolla and Richter (2010).

4.3.3 NOVEL PERSPECTIVES ON THE UNDERMINING EFFECT

The debate about the undermining effect (or: *crowding-out effect*, *overjustification effect*) probably started more than 100 years ago (Woodworth, 1918, p. 70). Recently, the subject regained much attention due to a publication of Locke and Schattke (2019), criticizing self-determination theory's dichotomy of motivation into intrinsic and extrinsic. They suggest that intrinsic motivation should be defined as pleasure from an activity itself (i.e., independent from the outcome), achievement motivation as a striving for excellence (cf. McClelland, Atkinson, Clark, and Lowell (1953)), and extrinsic motivation as any action involving means-ends

relationships. Ryan and Deci reply that following achievement theory (McClelland, Atkinson, Clark, & Lowell, Century psychology series. The achievement motive, 1953), flow theory (Csikszentmihalyi, 1990), and developmental psychology (Harter, 1974), competence is always a crucial determinant of intrinsic motivation, as ongoing incompetent engagement with an activity might not be enjoyable, and perceived competence is interrelated with a sense of effectance (2019). Furthermore, they elaborate that in self-determination theory, achievement motivation is not categorically labeled as intrinsic motivation, but depending on the motives for the achievement of excellence, it can be extrinsic or intrinsic. Lastly, as we can see in the chapter on self-determination theory, extrinsic motivation is the collective label for instrumental behavior, and subdivided into controlled and autonomous behavior (Ryan & Deci, 2019).

We have discussed the undermining-effect of extrinsic rewards on intrinsic motivation in the chapter on cognitive evaluation theory and in the context of self-determination and feedback. In this chapter, we will revisit the concept and enrich it with insights from neurology, in particular from a study conducted by Murayama, Matsumoto, Izuma, and Mastumoto (2010), who researched the undermining effect using fMRI. Several psychological studies investigating the undermining effect use settings with observed free-choice periods, i.e., participants are allocated to reward, and control-groups and are left to engage freely with an exciting activity, having the impression that the actual observation has stopped (e.g., Deci, Koestner, and Ryan (1999), and Deci (1971)). Usually, participants in reward groups engage less with the activity during the free-choice period, leading to the hypothesis that intrinsic motivation for the task got undermined by the extrinsic reward.

As Murayama, Matsumoto, Izuma, and Mastumoto (2010) summarize, the undermining effect contradicts economic theories (e.g., principle-agent theory), operant conditioning, and operant extinction (as extinction leads to a return to the non-stimulated response, instead of a weaker form of it). The undermining effect may be the result of the discrepancy between two differing valuations of task success. The dopamine-centric reward system lies at the core of subjective valuation, more precisely, subjective expectation of an outcome moderates activation in the anterior part of the striatum in response to feedback (Murayama, Matsumoto, Izuma, & Matsumoto, 2010). The midbrain, anatomically connected to the anterior striatum anatomically responds to both monetary and cognitive feedback, which both play a crucial role in the undermining effect (Aron, et al., 2004). Hence the expectation that observation of the undermining effect could be possible by measuring brain activity changes in the reward network

while responding to feedback, as well as decreased activity in the LPFC, due to its role in the preparation of cognitive control to achieve goals (Matsumoto, Suzuki, & Tanaka, 2003; Leon & Shadlen, 1999). As intrinsic motivation only occurs in tasks that provide an intrinsic value of achieving success, Murayama, Matsumoto, Izuma, and Mastumoto (2010) developed a stop-watch task, where participants had to press a button within 50ms of the 5s time point. The reward group could gain one point if succeeding. In the second group, participants had to press a button when the watch stops (watch-stop).

For this group, the authors did not define success or failure, arguing that, therefore, the task would be less interesting. Participants in both groups were compensated, but the received amount depended on the number of successful stops in the reward group, while compensation for the control group was random, but related to the reward group (i.e., on average, both groups received the same compensation). Following the official observation, the fMRI scan, and receiving the monetary reward, participants had three minutes to engage with the task, where the authors used the number of games as an indicator of intrinsic motivation. Afterward, the first observation was repeated, but participants were informed that they would not receive any performance-contingent compensation. Finally, a second free-choice period after receiving the monetary reward and an additional fMRI scan took place. The results of the free-choice periods reconfirm the existence of the undermining effect, as participants from the reward groups of the stop-watch activity played significantly fewer iterations of the game than their non-contingently rewarded peers. The differences between the control and reward group for the monotonous task were not significant, which may indicate that there was no intrinsic incentive to perform it. The results of the fMRI scan show bilateral anterior striatum and midbrain activation (reward circuit), irrespective of the monetary reward-component. While anterior striatum activation could be observed in both groups during the first session, it was much higher in the reward group than in the control group. The activation in the control group could be interpreted as the result of the intrinsic value of the task, and the additional activation in the reward group as stemming from the monetary performance-contingent incentive. However, in the second session, the authors could no longer observe any significant activation of the bilateral anterior striatum in the reward group, i.e., reversing the higher activation after the first session to lower activation in comparison to the control group. The activity of the midbrain was consistent with activity in the anterior striatum.

Furthermore, activation in the right LPFC was significant in the stop-watch task, as compared to the watch-stop task, indicating cognitive engagement. The difference of activation

was significant in a session-by-group difference analysis, with higher activation in the reward group during the first session than in the control group. In the second session, however, activation in the reward group became significantly smaller than in the control group.

Murayama, Matsumoto, Izuma, and Mastumoto (2010) infer that negative changes of activity in the anterior striatum, midbrain, and LPFC are connected to the undermining effect, mainly due to the high correlation of the magnitudes of activation changes ($mean\ r = .65$), and suggest a neural undermining index, and regressed it on the activity during the free-choice periods of the stop-watch sessions. The results disclose a significant negative correlation between the number of played games in the stop-watch setting and the index in the reward group, showing that participants less interested inactivity during the free-choice period also showcased a more substantial decrease of activation of the corticobasal ganglia network. In the control group, the relationship was not significant.

To conclude, the study provides neurological evidence for the existence of the undermining effect, specifically for the case when a performance-contingent reward stop, individuals do no longer experience intrinsic motivation to continue the task, as proven through the decrease of activation in the striatum and midbrain. Furthermore, the undermining effect is confirmed to work through a decreased sense of self-determination.

In the chapter on moods and motivation potential, we have briefly explored how moods may influence expectancy, lending from the interdisciplinary thought model of cybernetic feedback loops (Carver & Scheier, 2012). Murayama, Matsumoto, Izuma, and Mastumoto (2010) suggest future research on how the striatum integrates intrinsic value and the value of monetary rewards “[...] *on a unidimensional common scale* [...]” (p. 9), i.e., how it generates points of reference (Seymour & McClure, 2008). One possible explanation could be that monetary rewards modify the valuation of intrinsic rewards, and, consequently, the intrinsic reward becomes undervalued. Interpreting these suggestions in terms of the cybernetic feedback control system, it implies that while input remains unchanged, the subsequent modification of the reference value changes the outcome of the comparison process, result in different output.

While the experimental setup might not correspond to the fullest implications of the undermining effect, the study symbolizes how neuroscientific research can thoroughly support expansion and clarification of motivation research. Now, we can confirm the existence of the undermining effect from both psychological and neurological perspectives, but its elements might require further investigation. For instance, the task in the setting of Murayama,

Matsumoto, Izuma, and Mastumoto (2010) emphasized motoric action and could be, in terms of cybernetics, more of a “sequence” than a “program” (Powers, *Behavior: The control of perception*, 1973). Furthermore, in this setting, all participants received monetary compensation for their participation, and the authors do not discuss this implication, nor do they clarify whether participants were aware of the compensation before their participation. This leaves room for speculation about participation biases and would also significantly impact the derivation of the point of reference.

In a subsequent study, Murayama et al. (2015) altered the stop-watch setting by providing one group with an option to modify the appearance of the stop-watch, while the other group had to use a given interface. The results show that as a response to negative (failure) feedback, activation of the vmPFC dropped in the no-choice group, compared to the self-determined choice group. Furthermore, the “resilience” against negative feedback allowed participants in the self-determined choice group to perform better. This evidence might indicate that dopamine, which plays a role in valuation, project to the vmPFC. That perceived autonomy enhances intrinsic motivation and, therefore, performance is in line with self-determination theory (Di Domenico & Ryan, 2017).

4.4 PERFORMANCE-CONTINGENT MONETARY INCENTIVES

In the last chapter, we have discussed evidence for the existence of the undermining effect. However, the results do not explain why numerous behavioral experiments come to contradicting conclusions (cf. Deci, Koestner, and Ryan (1999)). Ergo, the neurological process presented in the last chapter may explain cases where the undermining effect does work, but not why it sometimes does not. In the field of business studies, we are in particular interested in the function of the undermining effect in terms of monetary incentives. For this reason, we will take a closer look at two recent studies, and develop a synthesizing idea of the undermining effect.

In the following, we will discuss the study of Strombach et al. (2015), who found that incentives do have an impact on the reward circuit of the brain, but not in task-related neural representations. The authors measured blood oxygenation level-dependent (BOLD) signals before (baseline), with incentive, and after incentive removal, which indicates neural activation and the activated brain region (Huettel, Song, & McCarthy, 2008). The experiment consisted of three blocks observations in which participants had to determine whether presented solutions to calculations are correct or wrong. In the first block, participants received no feedback on their answer, in the second block, participants received feedback and a performance-contingent

monetary reward, which in the third block again removed. The behavioral results show no significant increase in performance (i.e., correct answers) from block one to two, but a significant drop in performance after the removal of the incentive in block three. The authors also introduced a self-reporting questionnaire to assess motivation, fun, and demotivation of the participants. Unfortunately, the authors provide insufficient information on the questions and let the participants finish the questionnaire not immediately after the respective block treatment, but at the end of the overall experiment. Furthermore, participants received monetary compensation for their participation, which might delude the additional performance-contingent reward.

The lack of an increase in performance from block one to two aligns with the hypothesis on chosen effort levels, as discussed in a previous chapter. Participants were, due to an "unknown" benefit, or, unknown level of difficulty, already performing at their motivation potential. So, on a positive side, the monetary incentive maintained the effort level, but could not increase it. Furthermore, Strombach et al. (2015) found additional evidence that incentives do change the valuation of the reward, but do not change task-related activation. The study confirms that the vStr handles (1) general reward processing and its observation would track incentives, and (2) reward-prediction errors.

Consequently, the vStr might be relevant for updating references and learning processes (O'Doherty, et al., 2004), while activity in the vmPFC might be relevant for subjective value (Hare, Camerer, & Rangel, 2009; Strombach, et al., 2015). Since in the given study, the vmPFC deactivated with the monetary incentive, we might conclude that the subjective ("intrinsic") value of the reward got overwritten. Again, these findings support parts of how Ryan and Deci expect the functioning of the undermining effect, but still do not adequately provide a theoretical construct to anticipate when undermining will occur, and when not.

4.5 ENERGETIC AROUSAL AND THE UNDERMINING EFFECT

Strombach et al. (2015) implied that the undermining effect might result from the choice of an optimal level of effort. The observation, that performance between block one and two did not increase since the unknown task benefit already reached the motivation potential, provides hints for an arousal-based explanation of the undermining effect. As discussed in the chapter on novel perspectives on task difficulty, effort, and motivation potential, Gendolla and Richter (2010) come to a similar conclusion, if we assume that the participants (on average) experienced an optimal level of energetic arousal. The implications of assuming similarity between the results from the study of Strombach et al. (2015), and the model we developed in chapter 4.3.2

Complex Moods Determine Effort Via Expectancy, may provide a clarifying theoretical approach.

Let us assume that the participants from the study of Strombach et al. were (1) indeed unaware of the expected benefit or task-difficulty of the setting, and (2) in a motivational state of high energy, and optimal arousal. The effects of an additional incentive may depend on the magnitude of the incentive: in the study of Strombach et al. (2015), the contingent monetary compensation was 2€ for each correct answer, which we can carefully assume is not an exorbitantly high reward. As we would expect and can observe, the range of the share of correct answers got smaller, with a slightly higher average, when the additional reward was introduced. We can argue that those participants that were not in an optimal state of arousal, but slightly below, increased their arousal toward the optimum, and, therefore, increased their motivation potential, which, ultimately, lead to slightly improved performance.

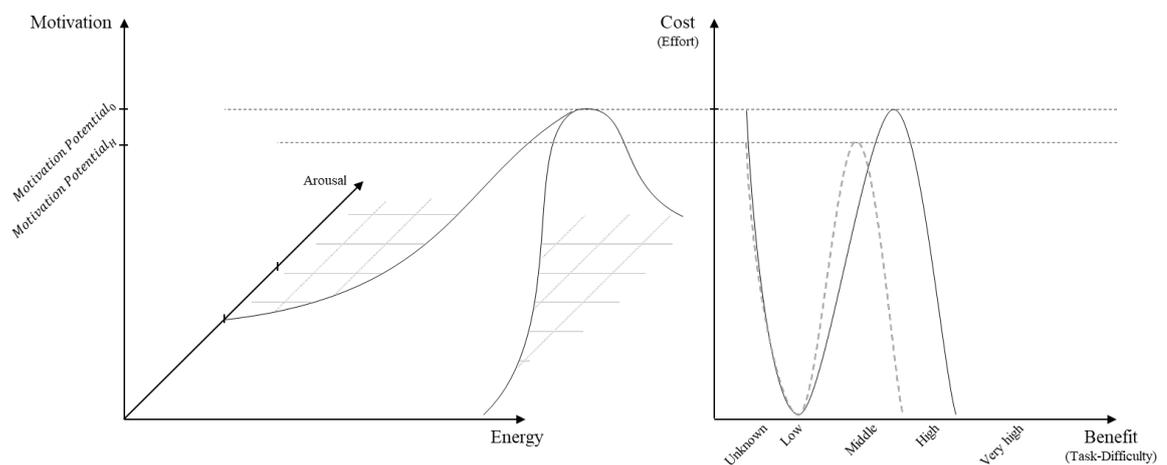


Figure 13 Impact of an Increase in Arousal on Motivation Potential

Now, let us assume that the contingent monetary compensation was 200€, instead of 2€. Presumably, this amount of money would make quite a decisive difference for most of the participants, as they could quickly multiply their potential daily spending with it, i.e., it would drastically increase their arousal. Following our two assumptions, now, the monetary incentive would push the arousal level of the individual above the optimum arousal, and, therefore, lowers effort through the adjusted motivation potential, with energy remaining unchanged *ceteris paribus* (see in Figure 13 the shift from *Motivation Potential₀* to *Motivation Potential_H*). One might wonder why the perceived task-difficulty changed but with such high stakes for every wrongly answered question, and no significant increase of perceived competence, individuals will not feel sufficiently equipped to master the task, as every wrong answer now has a very high price tag to it.

Now, why does removing the incentive lead to a lower level of performance than in the baseline? Prospect theory, as introduced by Kahneman and Tversky (1979), states that individuals have an asymmetric perspective on gains and losses, with a steeper value function for losses than gains. That means a loss of the same value as a gain would create more disutility than the gain would provide utility. Using images of faces expressing emotions, researchers found that activity in the limbic and insular brain regions is higher when looking at faces expressing negative feelings than in faces expressing positive feelings, i.e., negative and positive feelings are non-linear and non-binary (Fusar-Poli, et al., 2009). This neurological underpinning of prospective theory allows us to hypothesize, that the larger delta in performance between performance-contingent incentivized, and afterward no longer incentivized groups might be an effect of the loss-experience of the reward. The implications from loss experiences range widely from distress to a reduction in cognitive effectiveness and problem-solving capacity, depending on the intensity of the emotional arousal (Caplan, 1990). Following this perspective on loss experiences, we can assume that the removal of the incentive does not only weigh more substantial than its introduction, but the negative aspects get also intensified through another increase of arousal, which might push individuals even further away from the optimum.

4.5.1 THE UNDERMINING EFFECT AND PRACTICE

Principal-agent theory, after its emergence in the 1970s, dominated the understanding of motivation in economics and suggested that incentives assure alignment of the agent's interest with those of the principal (Jensen & Meckling, 1976). In businesses, this implies that whenever ownership and control of a company are separated, target conflicts will arise. Managers, if owning a share of the company's equity, are only subject to incremental costs and profits, as compared to the overall company's value (cf. Zwiebel (1996)), and often engage in empire building, since firm size significantly correlates with compensation (Tosi, Werner, Katz, & Gomez-Mejia, 2000). As a result, the majority of CEOs receive compensation mixes, which on average, consist of 49% stocks, 23% bonuses, 13% base salary, 12% options, and 3% other forms of compensation (Equilar Inc., 2017).

Considering the findings in the last chapter, the dominance of performance-contingent monetary rewards appears to be counterintuitive. In the study "*People's naïveté about how extrinsic rewards influence intrinsic motivation*", Murayama, Kitagami, Tanaka, and Raw (2016) presented the setup of the above-discussed study by Murayama, Matsumoto, Izuma and Matsumoto (2010) to a total of 259 participants from two groups and asked them to anticipate

the outcome, while also indicating how confident they are with their prediction. A significantly larger proportion of 56.4% and 68.5% of participants expected the rewards to increase motivation, while 25.5% and 13.8% correctly expected a negative effect, and 18.1% and 17.7% expected no effect. Those participants were wrongly expecting a positive effect from the reward report significantly higher confidence levels. As the authors of the study state, people firmly, but wrongly believe in the principally motivating effects of monetary rewards.

Drawing from education research, inaccurate metacognition, i.e., an inaccurate understanding of a cognitive state (Murayama, Kitagami, Tanaka, & Raw, 2016; Cambridge International Education Teaching and Learning Team, 2020), could be elevated to explain wrong cognition regarding motivation, i.e., metamotivation. In parallel with inaccurate metacognition causing suboptimal self-regulation strategies, inaccurate metamotivation might lead to suboptimal motivation strategies. Existing research shows that individuals are pessimistic regarding their ability to be intrinsically motivated without extrinsic rewards (Murayama, Matsumoto, Izuma, & Matsumoto, 2010), underestimate intrinsic values in future and past tasks (Woolley & Fishbach, 2015), and misjudge the benefits of autonomous goals (Wener, Milyavskaya, Foxen-Craft, & Koestner, 2016). The study of Woolley and Fishbach (2015) states that individuals are more engaged with how interesting their present work is, rather than how interesting past or future work is or will be. This observation explains the overestimation or misjudgment of the effects of extrinsic rewards. We could deduce that this phenomenon evolves from an interaction of the information-knowledge gap-hypothesis (Golman & Loewenstein, 2018) with the step of valuation in the cognitive prediction process. In the present, reward prediction errors may occur less, as information on the intrinsic value gets generated and experienced at the same time. For the future, however, the intrinsic value might be harder to predict, especially if we consider that Murayama, Matsumoto, Izuma, and Matsumoto (2010) insinuate that monetary (extrinsic) and intrinsic valuation occurs on the same, unidimensional scale in the striatum. The expected value of a monetary incentive can be easily compared by notionally receiving the reward today (if I will receive 200€ in the future, what would I do with that today?) while anticipating the expected value of an intrinsic reward is more complex and not easily comparable. In short, predicting the value of future extrinsic rewards provides more information than predicting future intrinsic rewards. Thus, the prediction accuracy of extrinsic rewards is more accurate. This hypothesis adds to the idea that knowledge is a source of the success or failure of self-regulation, i.e., that knowledge about motivation is a pre-condition of effective regulation (Scholar, Miele, Murayama, & Fujita, 2018)

4.6 DISCUSSION

We have introduced the regions and circuits of the brain relevant to motivation research, and compared and revisited prevalent concepts between neurology and behavioral research. The comparison has shown that neurology has entered the field of motivation research, terminologies and concepts are already used differently, while the underlying observed ideas are similar. Right now, this divergence, while probably facilitating the access of neurological research to the field in the short-run, will intensify the isolation of fields of research in the long-run.

Furthermore, we have used novel insights to expand on the explanation of the undermining effect to demonstrate how neurological and cardiological research will enhance the explanatory power of motivation theories and provide clarity for many discourses. Using the introduction of this chapter was already sufficient to understand and connect the neurological findings to existing motivation theories, which illustrates that these fields of research must not necessarily be divided. The presented hypothesis on how the undermining effect works through complex moods requires a strong theoretical foundation but requires explicit testing. Generally, this idea could be an ideal example of how neurological research contributes to existing discourses in motivation research and provides a common ground for future research.

4.7 CONCLUSION

While terminologies and concepts appear to be different in neurological research on motivation and established motivation research, they all rely on shared principles and are, de facto, similar, sometimes even equivalent. As we have seen, even within motivation research, an overlap between concepts exists, which causes fragmentation within the research community. Au contraire, some concepts, as, e.g., volition, might be promising expansions that provide clarification and contribute to the specificity of the academic discipline. In general, it is and will be difficult to judge whether new terminology causes greeble, or results in finer granulation of motivation research. Nevertheless, the addition of neurology and cardiology to the area of motivation research will shed light on existing theories, as well as contribute to the development of new ones. Communication across academic disciplines is possible and could improve the effectiveness of the field of research significantly. Further meta-analytical work on terminology, especially with a focus on different fields of research, as the present publications tend to focus on the field of education.

5. FEEDBACK

We will start defining feedback by revisiting the idea of cybernetics, which defines it as the way how a system exercises self-control through influencing output by changing input variables, corresponding to information about prior output (Carver & Scheier, 2012). In management theory, the definition is similar, however, the focus shifts from output to every step in a process, and is always relative to a reference value, which might be located outside of the own process. Ramaprasad (1983), therefore, defines feedback as “[...] *information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way.*” (p. 4). Furthermore, he argues that if data on the reference level, on the actual level, or a mechanism for comparison is absent, there cannot be feedback. Lastly, the information on the gap must be used in some way; otherwise, it is not feedback.

Ramaprasad’s definition derives from industrial comparison, and his argument against a restriction of feedback on input might be a reaction to Porter’s idea of the value chain (1979). Resulting from the insights of the previous chapters and elevating the definition for the use in this thesis, we may understand “input” the same way cybernetics do, i.e., as a function of perception, providing information about present circumstances. Ramaprasad suggests that the “process” includes methods or work procedures, which could be well interpreted as outputs of the comparison-process. If a system (or individuals) detects a discrepancy between reference value and output, adjustment of the used method is the output of the process, instead of the process itself.

Overall, feedback always involves a possibly infinite chain of cause-and-effect, which results in an adjustment loop to interact with a reference level: it “feeds back”. Ramaprasad (1983) explains that reference levels may be historical, based on visions or missions, benchmarks, or arbitrary. This definition of reference values is incomplete, and possibly confuses reference values with goals: in any sort of feedback loop, the reference value can be the prior output. Otherwise, we would not be able to explain how any sort of new inventions got improved, as direct references are not always present. At this point, the discussion of set goals versus “do-your-best” activities might restart, but in any of these two settings, feedback is considered at work. Claiming that set goals support faster and more efficient achievements could be true, as feedback loops involve more information about the desired output when it is already defined. In conclusion, while reference values are a necessity for feedback, their source must not necessarily be external, but can also result from prior output of the same system.

Finally, and most crucially, the information about the gap itself only counts as feedback, if it gets used for an alteration of the gap. This clarification is essential to Ramaparsad; however, it is evident in the cybernetic definition of feedback, that the output is the direct result of the comparison process. Not using the information from the comparison process would result in no output, and therefore, the feedback loop would be incomplete.

5.1 DEVELOPMENT OF FEEDBACK IN BUSINESS ORGANIZATIONS

42% of all employees regularly receive an evaluation of their performance from their supervisor through a defined procedure (Statista, 2016). In the following chapter, we will approximate the roots of modern employee evaluation systems, try to understand their goals, and discuss whether those systems are capable of providing feedback, or just information.

Scientific management, usually attributed to US-American engineer Frederick W. Taylor introduced the quantification of workflow with the primary objective to improve labor productivity (Taylor, 1911). The development of scientific management fired the starting shot for efficiency principles as Fordism, operations management and research, lean management, process management, and Six Sigma, which still play a vital role in business optimization. In scientific management (or: Taylorism), after external observation, output (usually a piece-rate) and input (methods, time, tools) of workflows get precisely defined. The resulting quantification allows measurement of efficiency and harmonization of a factory's assembly line. Furthermore, Taylor introduced two groups of incentives, one regarding the execution of work, with a defined minimum workload and a bonus for its surpassing. The other group allowed workers to advance in the organizational hierarchy: a well-performing worker had the chance of becoming supervisors, which oversee (i.e., evaluate) a process or learn other workflows (Bassim, 2014).

Arguably, feedback processes or employee evaluation system must have been in place in businesses before scientific management, but Taylor might be the first to introduce it on a larger scale and across interrelated workflows. Interpreting scientific management as a feedback-system might appear counterintuitive. On the one hand, Taylor's four leading principles do not explicitly mention how information is used. On the other hand, as the main goal is to improve efficiency, information, as output rates, must be compared to previous rates, and implicitly provide evaluative information: surpassing the rate means success and for the individual worker positive reward. We can assume that since high-performing workers are promoted to supervisors, they will coach workers who are undercutting their quota. Ergo, Taylorism does

not only produce reference values but also information to act upon the result of the comparison process.

We find further evidence for this interpretation when considering the modern-day management system, which roots in Taylorism. Lean management, e.g., perfectly captures the organizational application of cybernetic feedback loops (Womack & Jones, 1996). While initially developed as an operating model for production processes, the application is possible for virtually any kind of process. In step one, Womack and Jones want to define the value for the customer, i.e., the reference or program. Steps two (identification of the value stream), three (continuous product flow), and four (pull-system) are sequences of the program to achieve the desired customer value and provide hierarchically downwards feeding references, which will, ultimately result in program output, which provides input to all sequences.

These principles are elevated for their application in modern-day work organizations, not just at conveyor belts. Human resource departments provide detailed descriptions for jobs, most of the common incentives are very similar to Taylor's, and quantification allowed the development of management by objectives (Drucker, 1954), which profoundly connects to goal-setting theory (Locke & Latham, 1990). Consequently, most of employee evaluation systems follow the idea to set clear goals (i.e., outputs or outcomes) for the employee and assist with improvement or development, which reminds significantly of Taylor's incentives. Nowadays, however, by no means, those goals must be quantifiable, but always measurable, e.g., through comparison. Lastly, besides providing support the employee development, performance, or goal-achievement measurements are also a tool to provide legal evidence, e.g., for lay-offs or differences in pay (Heathfield, 2019).

The background of employee evaluation in engineering and industrial optimization may explain why today's systems seem to focus on (output) control. Measurement of qualitative performance still has its obstacles and might either occur through quantification (e.g., customer satisfaction-ratings with customer service representatives), or comparison to coworkers. Providing information to act upon gaps in quantified outputs is easier provided, as we could saw in Taylorism: the "better" process is the one with higher output at the same time, and the person who achieves this relatively higher output supervises the others. However, for qualitative outputs, not only determining the reference value is harder, but also how to close the identified gap.

5.2 STATUS-QUO OF FEEDBACK IN WORK ORGANIZATIONS

A previous chapter defines feedback as a general concept, but not in the specific context of work organizations. Efficient organizations divide and exchange labor, which allows cooperation and specialization, i.e., a high degree of specialization per employee increases the value creation of the firm, as a specialized individual is more efficient due to their skills and learning effects (Jost, 2008, p. 264). On the other hand, with an increased division of labor, transaction costs will rise. Value creation is optimal, as long as an increase of specialization, i.e., division of labor, yields a higher marginal increase of value than the associated marginal increase of transaction cost (cf. Figure 14). We may assume that the marginal increase of value from specialization follows an exponential rise to a limit, similar to a learning curve (Gu & Takahashi, 2000), and with ever-increasing specialization, transaction costs will rise exponentially.

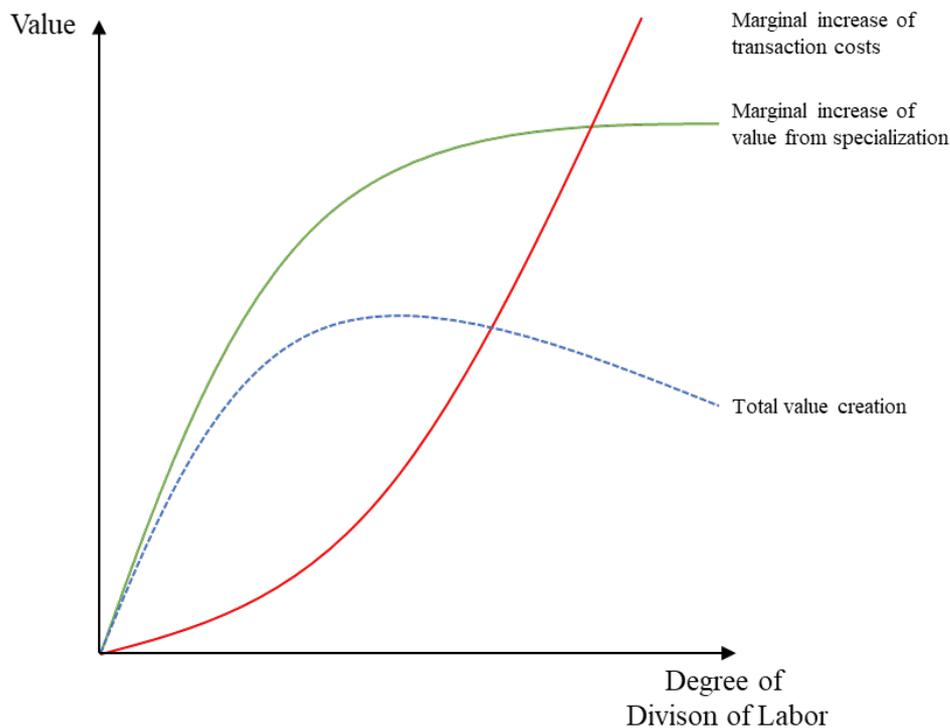


Figure 14 Illustrative Trade-Off Between Specialization and Transaction Cost

Designing the optimal organization concerning this trade-off is called the **organizational problem**, and as Jost (2008, pp. 266-271) suggests, can be split into the coordination problem, and the motivation problem. The coordination problem involves the optimal degree of specialization to maximize productivity, and how cooperation between employees can, by design, work as seamless as possible. This problem can be solved by a coordination plan, i.e., the organizational structure. From a rational perspective, the coordination plan should already

result in optimal value creation. However, we cannot assume that every employee's utility maximization is aligned with the one of the company. An incentive structure could align the employee's goals with the company's optimal value creation. Coordination instruments are the sum of measures that shall solve the organizational problem. Those are, e.g., job design, horizontal and vertical integration, guidelines, decision-procedures, and communication processes (Jost, 2008, p. 268). Motivation instruments are the sum of measures that shall align the employee's goals with those of the organization, especially if they are a priori diverging.

In work organizations, job evaluation methods are used for a systematic determination of how much value a position creates, or in which pay structure a position should be positioned. Job evaluation starts with job analysis to clarify the required skills for the associated tasks. According to a survey conducted by Mercer (2016), 57% of companies report that methods of job evaluation add value by enabling salary benchmarking with the external salary market, 43% by enabling internal comparability of jobs, and 43%⁹ through organizational alignment. More than 90% of the participants agreed with the statement that job evaluation helps to make reliable compensation and benefits decisions. Accordingly, job evaluation methods are mainly coordination instruments, but also motivation instruments, or, derived from Jost (2008, p. 269), a coordination instrument as superiors rules, from which motivation instruments are derived as inferior rules, i.e., coordination instruments actively shape the organization, which limits the design of motivation instruments. Despite the inferiority of motivation instruments, they provide feedback about the effectiveness of the selected coordination instruments. Assuming that from a job evaluation, we see that a position requires high incentives, we could derive that a change of the coordination plan might be required.

The results of the survey mentioned above by Mercer (2016) show that job evaluation methods are instruments to solve the organizational problem (1) by coordinating job positions and responsibilities and (2) by anticipating a priori diverging conflicts of interest, which might require incentivization. Especially the latter might explain why 90% of participants expect job evaluation to make better decisions on compensation and benefits, having in mind that individuals tend to overestimate the effects of monetary rewards firmly (Murayama, Kitagami, Tanaka, & Raw, 2016).

58% of executives believe that their approach to performance management has no impact on employee engagement nor performance (Garr, Liakopoulos, & Barry, 2014). Consequently,

⁹ Top three areas, multiple choice

in the last years, we have seen changes in performance management processes, from annual ratings and rankings, towards ongoing feedback and coaching to improve employee development (Garr, Liakopoulos, & Barry, 2014). Some incorporated the learnings from the undermining effect, and limited performance-contingent monetary incentives, while also facing the reality of horrendous working hours spent with performance reviews. Deloitte, for instance, calculated, that their former performance management system consumes almost two million workhours annually, while (finally) accepting that performance ratings from supervisors reveal more about the appraiser than the appraised (Buckingham & Goodall, 2015).

The most common performance management tools are cascading objectives (or: goal cascading), instant feedback, annual rankings, 360°-feedback, and continuous feedback. Instant and continuous feedback are terms describing intervals or points of time for evaluation and are usually used in combination with rankings or 360°-feedback.

Annual rankings are scale-based evaluation systems, which require a mutual rating of employees, sometimes even including external agents, as, e.g., customers or clients. The ranking may include both financial and non-financial items. Examples for quantitative rankings can be sales per employee, while qualitative rankings can include ratings from customer satisfaction or the number of phone calls. The period of rankings may now differ, but especially before the digitization of data collection, they took place once per year, while they follow shorter intervals today.

360°-feedback refers to performance ratings from all individuals who are interacting with the appraised in their work environment, i.e., supervisors, subordinates, peers, customers, or suppliers (London & Beatty, 1993). The significant advance from 360°-feedback was the inclusion of external agents, which would provide information, e.g., customer intelligence, to leverage the company's competitive position. Examining the conceptual idea of the program, as described by London and Beatty (1993), we observe striking similarity to Porter's Five Forces (1979) and may understand that the roots of 360°-feedback are in strategy and see the employee as one aspect of five in the evaluation.

Cascading objectives are, as the name implies, top-down defined performance goals. Starting with organizational strategic objectives, each level of the hierarchy determines objectives for the next lower level of the hierarchy, until each employee possesses an individual set of goals. This approach appears to be intuitive, as one could assume that strategy-relevant knowledge is located at the top of the organization, rather than on its lower hierarchical levels.

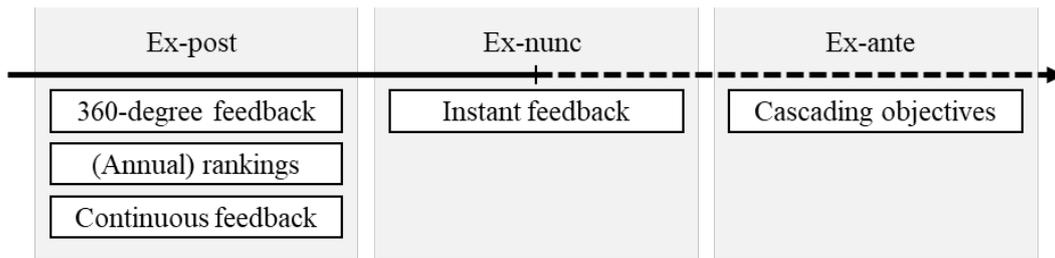


Figure 15 Chronological Classification of Feedback Systems

Figure 15 illustrates how feedback-principles can be categorized by their relation to performance, or creation of a reference. 360°-feedback, rankings, and continuous feedback all evaluate past performance. Instant feedback is (almost) simultaneous with the performance. Cascading objectives are not only setting references ex-ante, but by doing so, continuously provide information on performance, i.e., provides feedback over the entire timeline. A sharp distinction between those universal principles of feedback is difficult, as their definition depends on the respective execution. It might be useful to break feedback down into its content (qualitative or quantitative), and the reference point of the content (ex-post, ex-nunc, or ex-ante). Content should be differentiated according to the created reference, i.e., qualitative goals (customer satisfaction) measured on quantitative scales (NPS) are quantitative content. Table 3 provides some examples of qualitative and quantitative content references for different temporal applications.

Table 3 Examples of Feedback Differentiated by Content and Time of Reference

		Time of Reference		
		Ex-post	Ex-nunc	Ex-ante
Content	Qualitative	Friendliness of interactions in the past year	Friendliness of the interaction with a customer	Setting that the customer will never be interrupted during an interaction
	Quantitative	Generated revenue per account over the past year	Real-time performance information on generated revenue	Setting a revenue goal for the next year

As the execution of feedback in work organizations is not standardized and varies massively, even a single feedback-principle might be applied differently in terms of the interval, content, reference-point, and coordination, or motivational instrumentality.

5.3 TOWARD FEEDBACK AS A COORDINATION AND MOTIVATION INSTRUMENT

In the previous chapter, we found that currently, existing approaches to feedback are somewhat fuzzy and do not provide systematic value to both employer and employee. In this chapter, we will summarize which organizational goals feedback should achieve and how it can do so by being both a coordination and motivation instrument. In essence, feedback should point at the optimization of organizational value creation.

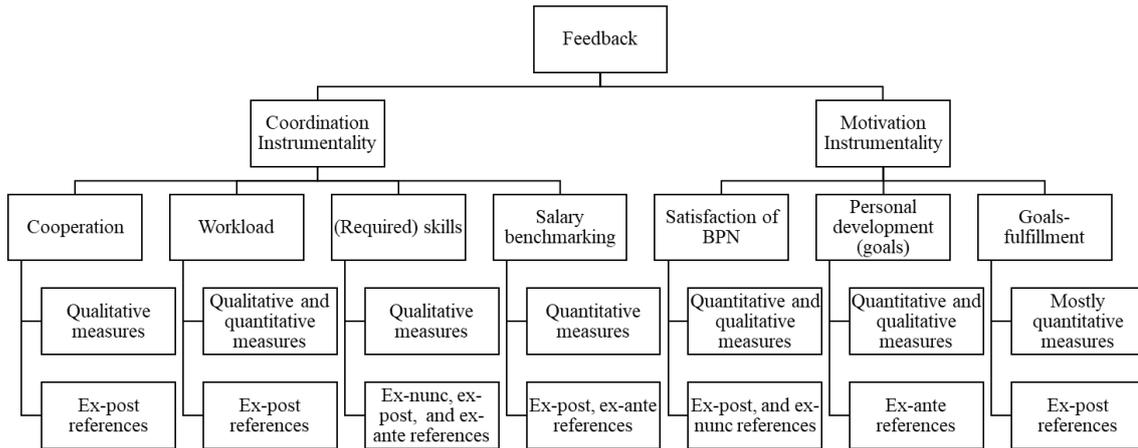


Figure 16 Areas of Feedback with Respective Instrumentality for Value Maximization

Figure 16 illustrates areas of feedback subdivided into their instrumentality for coordination and motivation. In general, measurement of the areas could always be quantitative or qualitative. However, the indication here stems from the current application in work organizations. Also, the setting of the reference point could always be in one of the three chronologically suggested intervals but is not recommended in some areas.

5.3.1 COORDINATION INSTRUMENTALITY

This category of feedback is crucially different from feedback as a motivation instrument. Information on cooperation, workload, skills, and salary can be collected directly from the employee, but also colleagues, supervisors, and external sources. Here, information flow is upwards, and the employee might not be the source of feedback, but rather the source of information to generate feedback. Measuring cooperation can work through qualitative surveys within workflows. Indicators of cooperation can be friendliness among colleagues, waiting times to receive completion-relevant information or pieces, and comparison of a target with actual values. Usually, those measures are compared to previous values, i.e., to ex-post references. Measurement of workload, again, can work through information from the employee, but also through observation of the employee’s output. Quantitative measurements are typically output-rates, as pieces, phone calls, or cases or comparison of throughput-rates (target vs.

actual, or historical comparison). Qualitative measurement, however, may involve the employee's self-rated level of stress. In most jobs, colleagues, supervisors, or HR-specialists derive a required skill set for a job. These are usually part of the job description and qualitative nature. A required skill set can be defined before and during a job, especially if the nature of the job changes over time. Finally, salary benchmarking works mainly through quantitative measures; as here, the work organization aims at compensating according to value-creation and market-efficient cost.

The difficulty of feedback as a coordination instrument lies in the correct measurement of the relevant areas and should be understood as a bottom-up source of information for organizational design.

5.3.2 MOTIVATION INSTRUMENTALITY

The determination of coordinating instrumentalities of feedback generally follows principles from economics, as, e.g., the division of labor and transaction costs. In several previous chapters, we found that economic principles insufficiently explain motivation. Principal-agent-theory correctly applies to mechanic conveyor-belt tasks or production processes, which provide little to no intrinsic reward for the individual. Furthermore, the mainly quoted paper of principal-agent theory by Jensen and Meckling was published in 1976, where, for example, in Germany, the producing industry (mining and saline, industry and crafts, energy and water supply, manufacturing industry, construction) made up more than 50% of the net value-added (Jensen & Meckling, 1976; Statista, 2012). Conventional economic approaches intend to incentivize the worker to meet a goal or fulfill their contract to the fullest. However, with increasing automation of repetitive workflows, especially in jobs in services and trades, the fulfillment of a job became hard to measure or challenging to specify. Now, the goal is to use the full performance potential of an employee and benefit from their experience, growth potential, and commitment.

5.3.3 OPTIMALLY MOTIVATING FEEDBACK

The chapters on self-determination theory in work organizations and on self-determination theory and feedback will guide the development of an understanding of the use of feedback as a performance-maximizing tool in work organizations. The underlying assumption of the following analysis is that we are analyzing jobs that provide intrinsic value to the employee per se, i.e., it is an axiom, that to some extent, facets of the workflow appeal to the "seeking system" which provides motivation potential for job-fulfillment (Ryan & Di Domenico, 2016; Di Domenico & Ryan, 2017).

5.3.4 RANKING- AND SCALE-BASED FEEDBACK

A study by Scullen, Mount, and Goff (2000), based on Wherry's theory of rating (Wherry & Bartlett, 1982; Wherry, 1952), investigated five significant factors that influence observation-based performance ratings by comparing the factors from four perspectives across three performance dimensions. The included significant factors were the ratee's general level of performance, the ratee's performance on a specific dimension, the rater's idiosyncratic rating tendencies, the rater's organizational perspective, and random error. These five factors can be categorized into three distinct groups of influencers on the rating. The first group refers to the actual job performance, which consists of the ratee's general level of performance and the performance on a specific dimension. The second group is rater biases, which include all effects that cause systematic variance in the performance rating with its root in the rater, instead of the ratee. The third group refers to random measurement error, which measures to the unsystematic variance in performance ratings. In Scullen, Mount, and Goff (2000) rater biases include the halo effect (Thorndike, 1920), which describes the tendency that a positive impression of an individual in one area may influence one's feelings and opinions about an individual in another area, and the leniency bias, which describes a tendency to rate another ones performance as better than it is, especially for low-performers (Ng, Koh, Ang, Kennedy, & Chan, 2011; Cheng, Hui, & Cascio, 2017). Besides of other effects, as, e.g., the rater-ratee-interaction, they label those systematic variances of performance ratings with their source in the rater as the idiosyncratic rater bias. The result of the study shows that more than 50% of rating variance stems from the idiosyncratic rater effect, and the summed effect of the general and dimensional ratee performance accounted for only 25% of the variance (Scullen, Mount, & Goff, 2000).

The above-presented results challenge all existing rating-procedures, especially if they are as crucial as in work organizations. Correcting ratings for rater biases remains challenging, as well as the development of assessment-tools which may omit rater biases (Hoyt, 2000; Facticeau & Craig, 2001; Govaerts, Schuwirth, Van der Vleuten, & Muijtens, 2011; Ng, Koh, Ang, Kennedy, & Chan, 2011).

Reflecting on the results that challenge performance assessment based on ratings, work organizations should attempt to avoid their application, in particular, if used as a motivation instrument. The inaccurate results may conflict with the ratee's self-perception, and, in either way, lead to undesired outcomes for performance.

5.3.5 EVALUATIVE, COMPARATIVE, AND DESCRIPTIVE FEEDBACK

Burgers, Eden, van Engelenburg, and Buningh (2015) conducted a two times three between-subject experiment, over the dimensions of positive vs. negative, and descriptive vs. comparative vs. evaluative feedback. The results show that individuals who received positive feedback enjoyed an enhancement of perceived competence and autonomy, compared to individuals who received negative feedback, which will, ultimately, increase intrinsic motivation. Evaluative feedback increased the repetition of the action, in contrast to comparative feedback. While negative feedback decreased perceived competence, it motivated individuals to engage with the task immediately again. Burgers, Eden, van Engelenburg, and Buningh (2015) present the in their experiment used messages which would convey the respective feedback. The reason that they were not able to find a significant effect of descriptive feedback in comparison to the other types might be that their message included the sentence “*You did [not] achieve this*”, which is a value-judgment of the performance. The message for negative evaluative feedback included the sentence “*Poorly done!*”, which might be a more extreme value-judgment, but states a reference as much as in the descriptive bracket. Descriptive feedback should involve an implicit reference (Chua, Lee, & Fulmer, 2017).

The results of the study are not surprising in the light of self-determination theory, the reward prediction error, and, in general, the concept of the information-knowledge gap. Descriptive feedback requires the receiver to have an internal value-judgment. If we consider the cybernetic definition of feedback, descriptive feedback is the mere information on whether reference and output are equal. The valuation works through the reward prediction error, i.e., activation of dopamine neurons occurs if a discrepancy exists to adjust the expectancy of the reward. Descriptive feedback usually contains no direct instrumental information on how to improve for the next trial, but instead reflects on the receiver’s output. The reflection might provide implicit information on how the receiver could improve its process for the following actions.

As expected, the impact of comparative feedback is polarizing. Positive comparative feedback pushes perceived autonomy and perceived competence, as the individual’s reference point is external, and they, therefore, positively erroneously predicting the reward. The opposite effect occurs for individuals receiving negative comparative feedback, which might be of higher magnitude due to (1) the devastating impact on perceived autonomy, and (2) the asymmetric perspective on losses. As the comparative aspect places individuals along a normative hierarchy of best- to worst-performers, we can assume that relatedness plays another significant role.

Furthermore, the informational value of comparative feedback is generally low if it does not inform on how better performers acted.

Evaluative feedback provides a direct point of reference and is somewhat similar to a feedback process without external agents. It contains information on the chosen process, as well as the output. In the Burgers, Eden, van Engelenburg, and Buningh (2015), the feedback message contained appraisal “*Well done!*”, as well as the information that the participant was rather quickly, i.e., which part of the process might have lead to the positive outcome. The positive and negative effects on perceived autonomy, competence, and relatedness might be similar to comparative feedback; however, especially the impact of negative feedback might be lower. Combining the value-judgment with information on how to improve enhances the instrumental value of the feedback, and promotes direct repetition of the action to adjust the expectancy. The above-discussed study precisely confirmed this assumption.

Reflecting on descriptive, comparative, and evaluative feedback, we can conclude that for positive feedback, comparative feedback might lead to the most substantial motivational outcome. The impact on perceived competence and autonomy is powerful, as the reference point is external and signals that of all possible processes, one chose the best. It increases relatedness to the sender of the feedback and the referred subjects, as they appreciate and support one’s process. Descriptive feedback, on the other hand, might have the smallest impact on the basic psychological needs, and could even lead to amotivation. While the results of Burgers, Eden, van Engelenburg, and Buningh (2015) on the contrasts to descriptive feedback were not significant, which might be due to a flawed experimental setup, we could assume that this type of feedback lacks instrumentality. Reflection on the process may foster the chosen processes; however, it requires more work from the receiver to improve the process, especially if the feedback was negative. Lastly, evaluative feedback provides both instrumental information and a value-judgment for the output, which, for positive feedback, satisfies all three basic psychological needs, and, for negative feedback, provides sufficient information for the receiver to adjust the process. Accordingly, participants were motivated to repeat the task quickly and test how the received information impacted the outcome.

5.3.6 NEGATIVE FEEDBACK

In the previous chapter, we have touched the aspect of positive and negative feedback, and also connected it to the prediction reward error hypothesis. Ten Cate (2013) pessimistically concluded: “*Clearly, Self-Determination Theory predicts that much of feedback provided in clinical settings will not lead to enhancing the intrinsic motivation of trainees. Perhaps we*

should just accept this.”. Looking at the impact of the three different types of feedback on the basic psychological needs, indeed, intrinsic motivation may be affected negatively. However, as we saw, evaluative feedback led to faster and more frequent repetition of the action (Burgers, Eden, van Engelenburg, & Buningh, 2015). Measured intrinsic motivation was low; however, it did not perish. The focus should not be on providing negative feedback in a way that enhances intrinsic motivation, but rather in a way which protects it by increasing volition. In a previous chapter, we have discussed that volition might be mainly influenced by the perceived locus of control. In negative comparative and descriptive feedback, the lack of instrumental information might create helplessness and amotivation, as the individual expects that they cannot do anything in their power to create better outcomes. Evaluative negative feedback, however, provides this information and maintains an internal locus of control, as the individual is capable of using the information to change the outcome.

Neurological investigations of negative feedback confirm this hypothesis: Eisenberger, Lieberman, and Williams (2003) examined the neural correlates of social exclusion and whether the brain bases of social pain are similar to those of physical pain. The anterior cingulate cortex (ACC) is active during exclusion, and activation correlates positively with self-reported distress, while activation of the right ventral prefrontal cortex correlates (RVPFC) negatively with self-reported distress. The ACC is involved in a variety of higher-level functions, as, e.g., the monitoring of conflicting goals. Pain, an indicator for an error, activates the ACC, mainly due to the caused distress, rather than the sensory experience of pain. The RVPFC might regulate the inhibition of distress. The pattern of those activations in participants experiencing social exclusion are similar to those in studies showing physical pain. These results underline that the experience and regulation of social and physical pain are built on the same neuroanatomical basis (Eisneberger, Lieberman, & Williams, 2003). Stillman et al. (2010) define social exclusion as a perceived deficit in belongingness, which is the need to be accepted in a group and form stable interpersonal relationships (Baumeister & Leary, 1995). Belongingness is, therefore, aligned with Maslow’s hierarchy of needs (Maslow, 1970), of which Alderfer’s ERG-theory is derived (Alderfer, 1969). Ergo, experiencing a loss of relatedness due to feedback, is equal to experiencing social exclusion: the group, the organization, repels one's actions and demands behavioral adaptation to assure future belonging.

We have yet only lightly touched the implications of the above-discussed study. The broad response of the brain to a threat comes with physically and psychologically changes: the

individual can only access a limited part of their memory (“gating”) (Elman & Borsook, 2018), they drive their attention towards negative stimuli (Reid, Salmon, & Lovibond, 2006), and the processing of social information might lean to aggression (Dodge, 1980). In severe cases, this reaction can cause “amygdala hijacking”, a situation where individuals show extreme emotional reactions, which they usually later regret or cannot understand (Nadler, 2011). It is impossible to embrace the just received feedback under these neurological circumstances constructively. We can explain the reaction with the model about complex moods and motivation potential. Experiencing tense energy vaults the degree of arousal from an optimal degree to overdrive. The motivation potential, therefore, decreases.

The apathy resulting from receiving negative feedback could also stem from the adapted expected cost of a reward. Assuming an individual already reached their motivation potential to the respective benefit, receiving negative feedback might signal that the task-difficulty is too high. The motivation potential drops, and therefore, the individual is amotivated. We have seen this relationship of adjusted expectancy and the resulting motivation potential in the study from Burgers, Eden, van Engelenburg, and Buningh (2015): receiving evaluative feedback provides improved information on the expected task-difficulty. Depending on the degree of arousal, the reward from the task can be sufficiently motivating to tolerate high task-difficulty. Through improved information on the required effort, task-difficulty can be re-estimated, and the result motivates new trials. Descriptive feedback, and, especially, comparative feedback might merely indicate that the chosen level of effort was too low. Without the necessary information on how to improve, the expected level of effort increases, probably to a degree which is not worth the benefit. Therefore, individuals were not motivated to try the action as often as those who received evaluative feedback.

5.3.7 FEEDBACK INTERVENTIONS

We have already discussed feedback interventions (FIs) in a separate chapter. As Kluger and DeNisi (1996) found in their meta-analysis, the impact of FIs on performance are differing. We will use their developed feedback intervention theory (FIT) to derive learnings for providing negative feedback, i.e., a feedback intervention. According to Kluger and DeNisi, feedback interventions are “actions taken by external agents to provide information regarding some aspects of one’s task performance”, which includes knowledge of results (information on performance), but excludes intrinsic feedback, task-generated feedback, or to the task-performance unrelated personal feedback (1996, p. 255). From this definition, we may assume that FIs usually use evaluative and descriptive feedback, which both provide information on the

outcome of the process and a value-judgment. Feedback intervention theory argues that aspects of the feedback sender and the feedback receiver influence meta task processes, focal task processes, and the task detail, which will either result in improvement or no improvement. Cues about the goals objective performance over time have an impact on the focal task processes, and plans for action strategies for learning have an impact on the focal task process. If the task required lower cognitive resources, and the receiver possesses high self-efficacy and can demonstrate rapid improvement, the intervention will lead to improved performance. Kluger and DeNisi argue that cues about goals provide motivational aspects for the receiver, and plans for learning provide more information about the task details.

There are two significant implications of feedback intervention theory for feedback: (1) providing negative feedback can indeed, if provided correctly, increase performance, and (2) the character traits of the receiver play a crucial role in how negative feedback should be provided. Feedback intervention theory can be used for the development of employee feedback systems, even if they are automated (Dowding, Merrill, & Russell, 2018).

Brown et al. (2019) deducted a systematic review and meta-synthesis of qualitative research on FIT to develop clinical performance feedback intervention theory (CP-FIT). While the background of the study is to develop a performance system for health professionals, the discussion of the applicability of motivation theories in different subject areas in a previous chapter confirmed that due to their joint research object, the human motivation process, transfer of findings should be possible. Like FIT, Brown, et al. state that receiver and sender variables are the first determinants to influence the feedback cycle. A successful feedback cycle, according to CP-FIT, begins with goal setting, and data collection and analysis. Then, provided feedback will be positively used if the receiver's interaction with, perception of, and acceptance of the feedback are successful. Interaction with and acceptance of the feedback depends on the individual characteristics (cf. self-efficacy from FIT). Acceptance of the feedback will lead to the intention of changing the behavior, which will, ultimately, result in performance improvement (Brown, et al., 2019). From here, the cycle starts again with data collection and analysis, or the setting of new goals. What Brown et al. discuss as the "goal" might translate into a point of reference, and therefore, not fundamentally contribute to the construction of a novel feedback intervention theory. What remains unclear is how to manipulate the steps of interaction, perception, acceptance, and intention at the side of the receiver.

"Putting feelings into words", i.e., affect labeling, is a successful process to regulate emotion (Torre & Lieberman, 2018). Individuals actively labeling their (negative) emotional

state as such achieve a reduction of the conscious experience, physiological response, and behavior resulting from the negative emotion. The neural correlates of affect labeling appear to be an antidote to what happens during an “amygdala hijack”: activation of the amygdala and other limbic regions diminishes, but activity in the right ventrolateral prefrontal cortex (RVLPFC), which is believed to regulate the response to distress, increases (Lieberman, et al., 2007). The inverse correlation activation of the amygdala and the PVLPCF is mediated by the medial prefrontal cortex (MPFC), i.e., affect labeling might tame the emotional reaction from the RVLPFC over the MPFC to the amygdala.

The interim results show that feedback interventions are usually negative, i.e., supposed to cause a change in the behavior of the receiver. FIT and CP-FIT show that both sender and receiver of feedback are responsible for a positive outcome of the intervention. Senders should assure that they are using the goal of the process as a reason for why they are providing feedback, which draws the receiver’s attention to the process. Furthermore, the sender should provide a plan or strategy for improvement. While suggesting improvement may harm perceived competence, it does support autonomy. Negative feedback and an increase of perceived autonomy are no contradiction: again, if the feedback provides instrumental information, it can be capacity building and enable self-improvement. If a situation requires harsh, emotionally offending feedback and the receiver shows low self-efficacy, dissatisfaction, and already a negative emotional state, using affective labeling is a helpful tool to de-escalate and regulate the fight-or-flight-response. Up to this point, the discussion has assumed that we have abandoned the recipient's perspective and can only attempt to regulate their emotional escalation. In organizations, however, the leadership style can play a supportive role in assuring performance improvement from negative feedback.

Derived from self-determination theory, leader autonomy support (LAS) describes the sum of managerial behaviors that facilitate self-determined motivation in employees (Slemp, Kern, Patrick, & Ryan, 2018). Characteristically, autonomy-supportive leaders are genuinely interested in their employees’ perspective, provide them opportunities to make own choices and give their input, encourages their self-initiative, and refrains from using extrinsic rewards or punishments for motivational purposes (Slemp, Kern, Patrick, & Ryan, 2018, p. 706). The benefits of LAS are increased engagement, performance, and well-being (Baard, Deci, & Ryan, 2004; Deci, et al., 2001; Hardré & Reeve, 2009). The meta-analysis of Slemp, Kern, Patrick & Ryan (2018) shows that LAS positively correlates with BPN-satisfaction, which correlates with autonomous work motivation, i.e., intrinsic motivation. Autonomous motivation strongly

correlates with general employee well-being and work engagement, and correlates negatively with general distress. A decrease of general distress and an increase of general well-being are excellent prerequisites for FIs that could lead to performance improvement, as CP-FIT has shown. Consequently, we may add to the interim results that we can, indeed, positively influence the receiver's perspective, which moderates the success of feedback interventions.

Negative feedback can easily lead to a loss of intrinsic motivation, and, therefore, a loss in performance, due to its damaging effect on BPN satisfaction. In extreme cases, individuals can overreact, which leads to negative consequences for everybody who is involved in the situation. The neurological foundations prove that while an overreaction may not be easily predicted, during the situation, affective labeling will support de-escalation. Overreactions can be avoided if the negative feedback contains information which fosters the focus on the goal of the task, and provides instrumental value to the receiver of the feedback. We can conclude from CP-FIT, the cybernetic definition of feedback, self-determination theory, and the reward prediction error hypothesis that optimal feedback contains a reference, and builds the receivers' capacity to reach the goal.

5.3.8 PRIMING AND THE FEEDBACK-SEQUENCE

A large number of coaches and manager magazines argue that putting negative feedback between two sequences of positive feedback (the sandwich method) would provide ideal outcomes (ten Cate, 2013). While the perception of the feedback changes, studies have shown that there is no improved impact on performance through the feedback-sandwich, as compared to other sequences of negative and positive feedback (Parkes, Abercrombie, & McCarty, 2012; Henley & DiGennaro Reed, 2015). Managers believe in having a working feedback-strategy when using the sandwich-method; employees, on the other side, experience the sandwich-method as dilutive of the actual talking point (von Bergen, Bressler, & Campbell, 2014). This impressive might stem from the serial-position effect, which consists of the recency and primacy effect (Ebbinghaus, 1885). In self-studies, Ebbinghaus found that the accuracy of recalling items of a list is a function of its position in the list. Items at the end tend to be recalled the best (recency effect), and items from the beginning of the list are recalled more frequently than those in the middle (primacy effect). Furthermore, sandwich-feedback might change the expected reward from the overall feedback in the long-run: employees anticipating feedback will incorporate that negative feedback will follow the positive feedback and interpret the method as a way of "sugarcoating".

We can understand the sandwich-feedback method as a way of priming, i.e., triggering a mode of positive affect, which will facilitate the acceptance of negative feedback. Unfortunately, the effect might work for the sender of the feedback, as they feel less “bad” about providing negative feedback, but not for the receiver. Nevertheless, priming can be used to deliver negative feedback constructively and instrumentally. In general, priming aims at evoking implicit responses to a stimulus that is outside of the individuals’ conscious awareness (Reeve & Lee, 2012, pp. 370-371). Primes can activate motives such as power and affiliation and autonomous motivation (Schultheiss, 2008; Hodgins, Yacko, & Gottlieb, 2006). In line with self-determination theory, in an experimental study, participants primed for autonomy showed less intention of escaping a questionnaire, and less tendency to provide “disclaimers” for weak performance (defensiveness), which enhanced their performance (Hodgins, Yacko, & Gottlieb, 2006). Priming in experimental studies often works through scrambled-sentence tests or crosswords, which have shown to effectively prime, e.g., rudeness or stereotypes (Bargh, Chen, & Burrows, 1996). Reeve and Lee (2012, p. 371) conclude that motivational states associated with positive valence can promote behavioral activation.

Positive environments, support, and empathy can have long-lasting effects on the neuroendocrine and psychological system related to pain and stress: the triggering of oxytocin induces effects that increase overall wellness, increases pain threshold, and reduces blood pressure and cortisol levels (Uvnäs-Moberg & Petersson, 2005). This state of affect is the polar opposite of an amygdala hijack, as it allows for new solutions and perspectives, without restricting perception of the moment.

Priming and the positive effects of oxytocin let it appear as if sandwich-feedback would be the ideal solution for providing negative feedback, but the difference lies in the conscious experience of the primer. As von Bergen, Bressler, and Campbell (2014) explain, the repeated use of sandwich-feedback shifts the receiver towards expecting negative feedback, sugarcoated by “forced” positive feedback, which might increase defensiveness.

The ideal proposition for negative feedback lies in the creation of an autonomy-supportive environment, which will shift the general emotional state of an individual. Priming can be used for one-time negative feedback, especially if it is minor in comparison to the positive feedback. Using positive words to start a conversation that underlines the competence of the individual might support their ability to receive negative, yet, constructive information.

Overall, the use of pre-defined feedback-sequences and priming is not supportive of general feedback-procedures. Their effectiveness might lie in the rare and pointed application.

5.3.9 THE TIME-COMPONENT OF RECEIVING FEEDBACK

The more time passes between an action and its rewards, the less motivational the effect will be (Merchant & van der Stede, 2017, pp. 365-366). Annual rewards, like profit sharing, commissions, or rankings, may play a role in forming a future time perspective (FTP). De Bilde, Vansteenkiste, and Lens (2011) found that high school students with high FTP are regulating their behaviors through internal motives (guilt and shame, personal conviction, and interest). This internal pressure is negatively associated with determination and use of metacognitive strategies. Stronger FTP does not predict higher extrinsic motivation – the future-orientation of the participants contributed to a more substantial commitment to present tasks but also predicted internal pressure. Another study found that in work organizations, employees with a higher focus on promotions derive growth and esteem motives from the future perspective, which enhances intrinsic and extrinsic work motivation (Henry, Zacher, & Desmette, 2017). Goal contents theory, a mini-theory of self-determination theory, states that extrinsically aspired individuals strive for instrumental outcomes. We may conclude, therefore, that rewards with a long delay between actions and responses are more useful for extrinsically oriented individuals. FTP provides a robust framework for the use of extrinsic rewards in incentive systems, which are supposed to enhance performance in the long run. Nevertheless, the application of extrinsic rewards, especially for extrinsically oriented individuals, will still be subject to the undermining effect if the reward gets removed.

Feedback, in particular, if it is positive, is best provided immediately after the performance (Chiviacowsky & Wulf, 2007). In contrast to negative feedback, processing positive feedback does not require an iteration of the used process. A just performed action reinforces the already exhibited behavior and actions, while negative feedback implies behavioral change, which requires more energy. Positive feedback does not require instrumental value, as the value-judgment in itself provides sufficient information, and enhances the basic psychological needs.

A recent study from Choudhary, Shunko, and Netessine (2018) on real-time feedback suggests that performance will always be worse after receiving feedback. In their study, drivers with an app that monitors their driving-behavior were able to receive insurance discounts if they achieved a score of seventy out of 100. Shunko argues that achieving seventy goals would be the goal for any user, and seeing that one is far below that value diminished motivation, as well

as already having achieved it. The results of this study contradict the argumentation of this thesis, especially regarding their finding that even positive feedback decreased performance. It turns out, however, that many of the considerations in the study are too short-sighted: first, the authors confuse information on performance with feedback. As we have discussed early, feedback must include a point of reference or a value-judgment. In the study, all five screens of the app are displayed. Rapid accelerations and harsh brakings, speeding, mileage, and driving time are recorded. While individuals might have internal points of reference for each of these points (e.g., speeding is dangerous and should be avoided, driving less is better for the environment), the app does not provide a proper reference. Harsh braking is counted, but the user is left alone to interpret that this number is supposed to be as low as possible. As far as we can derive from the study, the app provides information on four categories and then calculates a unified value judgment in the form of a score. Assuming somebody receives a low score, they would not be able to derive useful instrumental information on improvement for the future on all categories.

Revisiting the measurement of harsh braking – is the user supposed to run over everything that unexpectedly crosses the road the next time? Furthermore, the authors claim that the feedback would occur in real-time, but write: “*Real-time feedback delivers immediate effect on the user performance: users can observe their feedback after short time intervals (in our case after every trip) and learn from it.*” (Choudhary, Shunko, & Netessine, 2018, p. 3). While in this thesis, the point of reference (ex-post, ex-nunc, as-ante) is the critical component of the chronological definition of feedback, discussing the point of receiving the feedback is valid, too. However, receiving the feedback to a particular action after which other, not evaluated actions, already followed, should not be defined as “real-time”. Another driving and navigation app, Waze, shows the user their current speed and indicates exceeding the speed limit graphically through a red speed sign. This example could be defined as real-time feedback, as the user receives (1) the information at the same time they are performing the action, and (2) a value-judgment, as the change of the light-blue speed limit to a bold red sign is associated with a danger warning.

The implied time-component of feedback in the study is not ideal for future research. Furthermore, the lack of differentiation between providing information and providing feedback allows a different interpretation of the results. Confronting individuals with an arbitrary interpretation of their performance (here, the score), which does inadequately relate to their actions, decreases perceived autonomy. Without understanding why or why not their actions

lead to the desired outcome, the app becomes a tool for control. The influence on perceived competence may be severely negative for those achieving less than seventy points, as they feel either misjudged or left without instructions for improvement. Those achieving scores higher than seventy points might feel like receiving a positive reward without understanding what they did correctly in particular – i.e., it responds without clarifying what the stimulus is.

The time-component of receiving feedback starts once the desired outcome is defined. A process or action is not required per se, as one can receive feedback on not acting (e.g., not reacting to a flashing alarm light). We can conclude that delayed feedback, in general, has a weaker motivational magnitude, even though this magnitude might be higher for extrinsically oriented individuals. Real-time feedback, which occurs during an action or right after its completion, might support learning. Providing negative real-time feedback is challenging since, without instrumental value, it will decrease performance in any case.

5.4 DISCUSSION AND CONCLUSION

Currently, there are no consistent and widely accepted theoretical frameworks within the field of research on feedback. In this chapter, we have reflected upon the few existing models of feedback and distinguished them by their instrumentality, nature, time-component, and used instruments. This reflection has shown that in order to analyze the effects of feedback processes formally, an abstract model is required. As the focus of this thesis is on motivation and the discussion of the last paragraphs emphasized the (a-)motivating effects feedback can cause, in the next chapters, we will develop a motivation-based model of feedback.

The taxonomy of feedback in this chapter might by no means be exhaustive, but it indicates that depending on the use of feedback, the effects may be highly adverse. Consequently, a formal model of feedback could benefit both practice and theory. The biggest problem in abstracting feedback is to consider the different objectives sufficiently. Thus we see that on the one hand, feedback can be used for performance improvement, but measurement and monitoring. From the perspective of motivational effects, these goals are in sharp conflict with each other. A theoretically derived feedback model must, therefore, follow the original differentiation of the organizational problem. The different functions of feedback are derived from the solution of the organizational problem, i.e., monitoring and measurement solve the problem of optimal coordination, and performance feedback for optimal motivation. However, the current application in companies is far from being optimally motivating.

6. THE MOTIVATION-POTENTIAL MODEL OF FEEDBACK (MPMF)

In this chapter, we will compile all previous findings and construct a Motivation-Potential Model of Feedback. The model aims at unifying feedback with incentives and distinguish recommended feedback-based measures by characteristics of the position, the individual, and job goals.

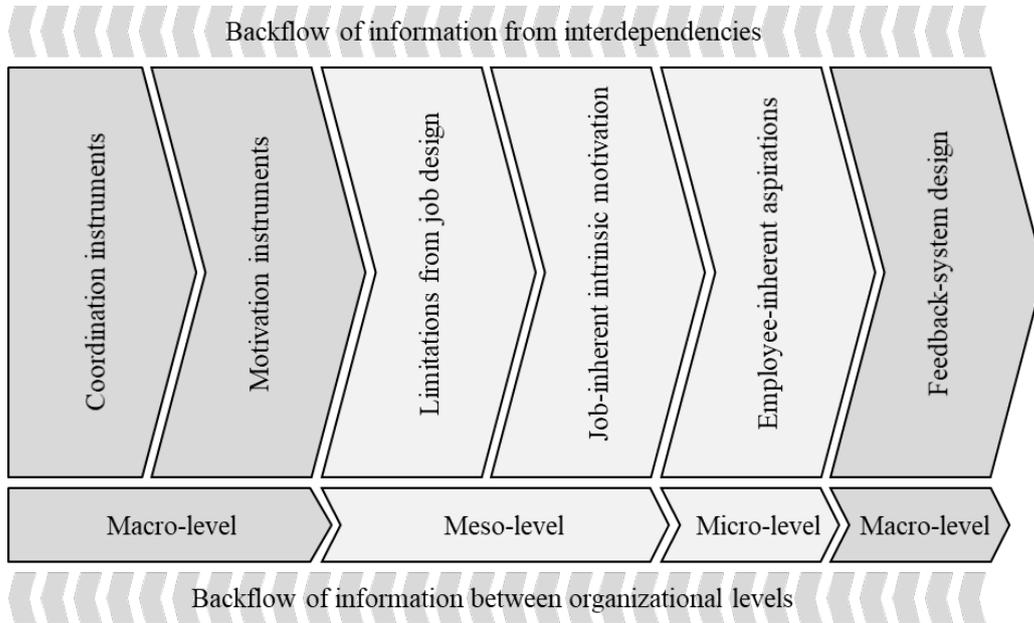


Figure 17 Feedback-System Design with Interorganizational Interdependencies

An optimized feedback-system should optimize the overall organizational value creation. As discussed above, organizational value creation depends on the effectiveness of inputs, which is limited due to the organizational problem. Solving the organizational problem works by choosing adequate motivational and coordinational instruments. Many organizations understand feedback mainly as streaming from the supervisor to their subordinates, yet, this approach neglects the employee as a source of information for coordinational optimization. If an employee is enabled to report that they spend a significant share of their productivity on coordinating with colleagues, supervisors might want to identify optimization potential in the organizational structure. Figure 17 illustrates how a feedback-system can be the result of coordination and motivation instruments, while in this figure, the following limitations in motivation instrument design are listed. The organizational perspective on the macro-, meso-, and micro-level underlines that motivation instrument-design should not be limited to a top-down approach. Individual traits and characteristics are important determinants of the effectiveness of motivation instruments.

In a previous chapter, we have analyzed complex moods as determinants of motivation potential. Guiding the employee into an optimal combination of medium arousal and high energy is not limited to influencing arousal through incentives. The job design in itself, as well as its location within the organizational hierarchy influences energy. If an employee spends too much time on coordination, they will spend a significant share of their energy on it, too. In an optimized coordinational structure, energy should be spent on the part of the labor for which the employee is specialized. Therefore, the trade-off between specialization and transaction cost (cf. Figure 14) is also a trade-off between the allocation of energy. Motivation instruments, on the other hand, are mainly focusing on managing arousal. Therefore, we could label coordination instruments as energy-managing, while motivation instruments are arousal-managing. Again, the goal of coordination instruments should always be to enable employees to spend the largest share of their disposable energy on specialized value-creation.

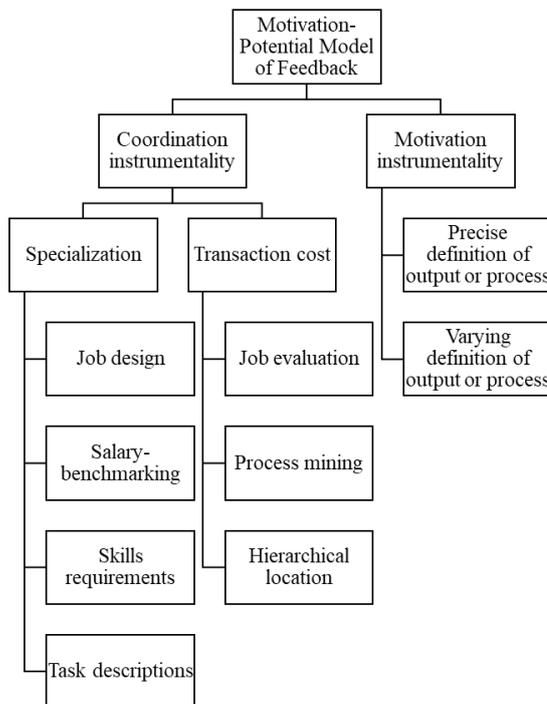


Figure 18 Design of Motivation-Potential Maximizing Feedback-Systems

Figure 18 illustrates which processes, decisions, and analysis are part of the overall feedback-system design with a focus on motivation-potential-maximization. As discussed, coordination instruments are inferior rules to motivation instruments and must be in place before designing motivation instruments. Nevertheless, the process is not streamlined, i.e., interdependencies and interrelations between processes exist. Just as the feedback itself, the system feeds back information to different processes and enables their optimization.

6.1 COORDINATION INSTRUMENTS FOR OPTIMALLY DIRECTED ENERGY

Coordination instruments are not the focal point of this thesis. For this reason, four processes are illustrated, but not discussed thoroughly. The degree of specialization of a job starts with its job design. Here, the output of the job should be defined. By defining the output, the required skills and description of the task (of the process) can be derived. Information on the desired output, as well as the suggested process, can be used to research adequate base salaries. By placing the job at an optimal position within the organizational hierarchy, the organization can minimize transaction costs. The location of the job position refers to defined subordinates and supervisors and is usually derived either from the flow of information or manufacturing process. Deriving minimal transaction costs can work through process mining and recurring job evaluation.

Hoshin Kanri, a lean management approach, aims at meeting or exceeding standards by aligning frontline operators with overarching managerial and strategic goals (Liker & Hoseus, 2008). The focus of Hoshin Kanri lies at a medium to long-term vision, a focus on process improvement, communication through the deployment of targets, and measuring performance by marginal (or continuous) improvement (Tennant & Roberts, 2000). The crucial aspect here is the flow of feedback: while strategic objectives may be first deployed from the top of the organization, frontline employees provide insights about their daily experience for kaizen (continuous improvement). While the top of an organization may be favored in strategy formulation, the bottom of the organization possesses the necessary knowledge about improvement in their workflows. A study by Sting and Loch (2015) shows that in the automotive industry, which is the cradle of lean management, 100% of strategic projects on the manufacturing process originate from middle and frontline levels. Across all investigated industries, 50% of annual productivity improvement stemmed from frontline initiatives, rather than new technologies, new product design, or the realization of economies of scale.

The application of a mixture of top-down and bottom-up for strategy execution, again, stands in a trade-off to transaction costs. If an organization is subject to high-paced strategical changes, the hierarchy requires an optimal degree between being loose and tight, i.e., *laissez-faire* vs. strict delegation (Huchzermeier, 2019). In a *laissez-faire*-oriented organization, the bottom-up emphasis might not lead to desired improvements, as the lack of supervision leads to strong cohesion between coworkers, and probably interferes with the implementation of bottom-up initiatives. On the other hand, in an organization with a deeply rooted top-down emphasis, horizontal coordination might be very loose, and the top-down content suppresses

bottom-up initiatives. Finally, an organization with strong bottom-up emphasis but lack of horizontal coordination will lose performance to friction from inconsistent delegation (Huchzermeier, 2019). Optimally, the balance of top-down and bottom-up strategy execution varies with coordination intensity. If horizontal coordination is rather loose, the emphasis should be on top-down, while with increased coordination intensity, the emphasis should shift to more bottom-up strategy execution.

The combination of top-down strategy deployment and bottom-up feedback on strategy execution works ideally through a supportive leadership style, which is characterized by increasing the satisfaction of the basic psychological needs and providing instrumental feedback (Schmidt, et al., 2014). Supportive leadership does increase not only self-rated health but also facilitates conjoint strategy execution and assures that both team leaders and workers understand strategies. Worker's strategy understanding has a significant impact on continuous improvement performance, i.e., leads to ongoing solution-building processes for the organizational coordination problem (Huchzermeier, Mercikoglu, & Scholz, 2019).

Concerning Total Quality Management, Lean Management Principles, and especially Hoshin Kanri, we recognize that a multiplicity of effective coordination instruments already exists. The origin of this instrument can be located in the manufacturing industry and describes the logical development of Scientific Management.

6.2 MOTIVATION INSTRUMENTS FOR OPTIMAL AROUSAL

Although we differentiate here between energy-optimizing coordination instruments and motivational instruments, coordination and motivational instruments are mutually exchanging, as pointed out in a previous chapter (Jost, 2008, p. 270). The coordination problem factors in the creation of the incentive structure, which equally influence the behavioral restrictions of the individuals. The motivation problem determines the organizational structure, which in turn regulates the work stimuli.

The determination of adequate feedback-instruments for optimal arousal is more complicated than the determination of coordination instruments. At the beginning of this chapter, we have seen that several organizations complain that their processes are too complex and lack favorable outcomes. In light of the differentiation between coordination and motivation, we can also see that most organizations do not distinguish between those two goals. While 360°-feedback is originally a strategy tool, it is mostly used as a way of sourcing feedback about one individual, rather than mutual enrichment in both ways.

6.2.1 DEFINITION OF OUTPUT AND PROCESS

At the core of optimal feedback lies the aim to maximize the motivation potential of the individual. In this thesis, we have seen that this task is cumbersome and depends on a range of variables. We will start the process by analyzing the goal of the job that the individual is supposed to accomplish, as noted in Figure 18. The MPMF shall suggest that through consideration of the process or goal, we determine whether a point of reference for feedback-loops is ex-ante present, or not. Jobs with a precise definition of outcome or process, as, e.g., in public service (process defined by law), repetitive low-skilled conveyor belt-positions, or packaging, provide only a few possibilities for employees to improve their perceived competence or autonomy. At the same time, the general objective of these tasks can be determined by target piece-rates or processing times. Now, the feedback or incentive-strategy depends on how intrinsically interesting the task is. The fact that a task is repetitive or does not require sophisticated skills does not necessarily define that individuals experience low motivation. One prominent example would be charity work, which does require much routine work, as, e.g., cleaning parks, handing out flyers, or preparing food. We will revisit the job as a source of intrinsic motivation in the next step.

The approach towards jobs without defined outcomes or processes is inherently different. The point of reference here is hard to define, and, as we have discussed in several chapters, might interfere with ex-ante existing intrinsic motivation. The difference between defined outputs and processes is, that comparison, extrinsic reward, and control are already existing. We can influence their magnitude, but the nature of the work disables us from altogether avoiding a possible undermining effect. While an undefined process might conflict with perceived competence, we could counterbalance the negative impact with the increase of perceived autonomy – vice versa for defined processes.

6.2.2 ASSESSMENT OF INTRINSIC JOB VALUE

After determining whether a job belongs to the category of precisely defined outcomes or processes, we have to investigate the intrinsic job value generated by executing the job. Distinguishing between the potential intrinsic value of the job can already depend highly on the respective employee. However, from a general perspective, we might assume that a common understanding of intrinsic job value might exist: in Germany, surveys asking about popular jobs are good indicators for the potential intrinsic value, as jobs high in those rankings receive high appreciation (forsa Politik- und Sozialforschung GmbH, 2019). Becoming a firefighter, for

instance, might be driven by anticipating social rewards and satisfying the aspiration to serve society.

Introducing extrinsic rewards in jobs that provide high intrinsic rewards will lead to undermining effects. Consequently, we must anticipate the intrinsic value before creating the respective feedback-system, which is the next step in the process.

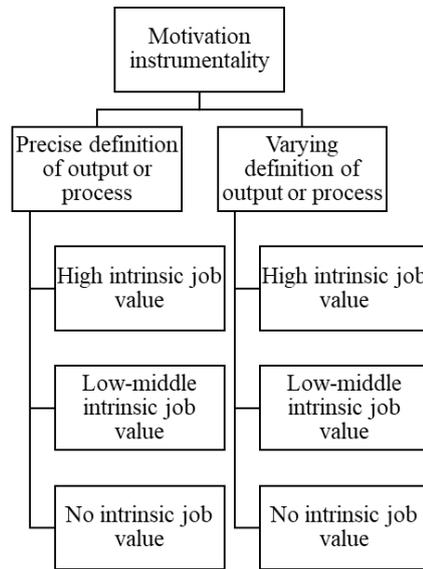


Figure 19 Segmentation of Expected Intrinsic Job Value

Looking at Figure 19, we can see that the process distinguishes by no, low to middle, and high anticipated intrinsic job value. The idea behind this trichotomy is that jobs which might not provide any intrinsic rewards can safely rely on extrinsic rewards, without potentially harming performance. Jobs with low to average intrinsic job value, on the other hand, will benefit from motivation instruments that are capable of increasing intrinsic motivation. Here we have the motivation potential model in mind because the state of arousal might, yet, not be in the optimal state. The adequate allocation of a job into this category might be challenging since low intrinsic motivation will benefit highly from an increase, while in the middle-area, the danger of rising arousal above the optimum is present. Jobs that provide high intrinsic value should focus on using systems that do not harm the motivation and secure it for the long run.

Anticipating the intrinsic value of a job might be difficult, especially for external agents without experience within the activity. One could circumvent the difficulty by assessing related jobs, or, ideally, individuals that are already working in the position. The Intrinsic Motivation Inventory (IMI), as used by Ryan, Deci, and many other motivation researchers, is a multidimensional measuring scale for the assessment of an individual’s subjective experience related to a target activity (Center for Self-Determination Theory, 2020). The IMI includes a

subscale measuring interest and enjoyment, which is, ultimately, the “pure” measurement of intrinsic motivation, while the scales on perceived competence, effort, value/usefulness, felt pressure and tension, and perceived choice is theorized to be predictors of intrinsic motivation. The scale on experienced relatedness awaits validation, while the validity of the overall scale is strong (McAuley, Duncan, & Tammen, 1989). For practical application, the use of an abbreviated scale is discussed (cf. Wilde, Bätz, Kovaleva, and Urhahne (2009)).

6.2.3 EXTRINSIC AND INTRINSIC ASPIRATIONS

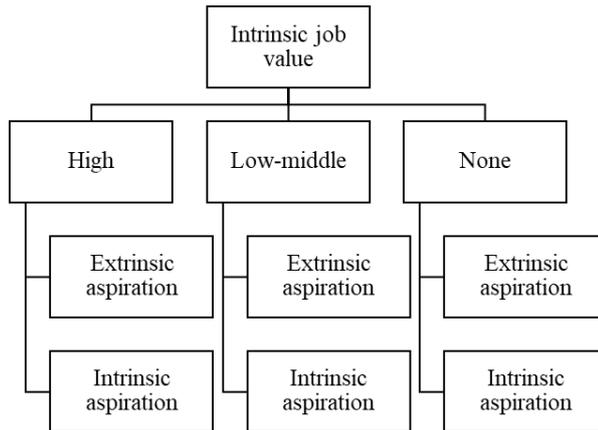


Figure 20 Differentiation According to Individual Aspirations

The final step in the motivation-potential model of feedback should be applied whenever creating incentive-systems and is the only process in which the micro-level of the organization is considered. Too many organizations create incentives that do not adhere to the individual’s personality and, therefore, might even reduce performance. We have discussed goal contents theory, a part of self-determination theory, earlier and found that we can broadly distinct between intrinsically and extrinsically aspiring individuals. For each category, incentives work differently: individuals with intrinsic aspirations might favor acknowledgment of their results in a one-on-one-talk, while individuals with extrinsic aspirations will get a “kick” out of receiving a reward in front of a vast audience.

The individual differences do factor into how feedback should be provided. Especially for extrinsic personalities, comparative feedback might add a function of public representation and drive to outperform the rest of the organization. For intrinsic personalities, they might be interested in expanding their skills and knowledge, which could be best done through evaluative and instrumental feedback within shorter intervals. In particular comparative feedback might disproportionately harm intrinsically aspirated individuals, as they have a stronger drive towards relatedness.

6.3. OPTIMAL TYPES OF FEEDBACK: PRECISE DEFINITION OF OUTPUT OR PROCESS

In Appendix I, we can see the results optimal types of feedback at the end of each assessed process on the macro-, meso-, and micro-level.

6.3.1 HIGH INTRINSIC JOB VALUE

Starting with jobs with precise definitions of output or required processes that provide high intrinsic job value, individuals with extrinsic aspirations will still benefit from the intrinsic value of the job. Nevertheless, they can be optimally incentivized by increasing their perceived autonomy and competence. This increase can be achieved by providing comparative instrumental feedback: information on their performance in the context of the overall organization appeals to their preference for achieving a higher status of popularity by being the person to push the goals of the organization forward best. For intrinsically aspired individuals, this type of job might be the most likely to provide them with the experience of flow and personal growth. Extrinsic rewards should be avoided at all costs since they will lead to decreased performance. Instead, feedback, if necessary, should focus on being evaluative and highly instrumental. The individual will be able to enhance their performance and potentially increase perceived competence and autonomy if the feedback is giving constructively and lead to quick improvements. Comparative feedback can be provided if the individual is performing well. Ideally, the organization should let the employee choose their preferred way of recognition, as, e.g., public rewards might cause feelings of discomfort.

6.3.2 LOW-MIDDLE INTRINSIC JOB VALUE

Deriving the exact level of intrinsic value created by those jobs is difficult. We should carefully weigh the pros and cons of introducing extrinsic instruments, as they might potentially harm intrinsic motivation, yet, the magnitude of the increased arousal of extrinsic measures might surpass the arousal generated from the intrinsic value. Since this fine line exists, we should apply comparative instrumental feedback, even for extrinsically aspired individuals. This combination of providing relative information on performance while showing how to improve the process or outcome should ideally enhance the satisfaction of all the basic psychological needs of the individual. For intrinsically aspired individuals, the level of arousal might be slightly above one of their counterparts. Therefore, extrinsic rewards are more likely to harm performance. Consequently, evaluative feedback with a high instrumental value might yield the best results.

6.3.3 NO INTRINSIC JOB VALUE

It is questionable why individuals engage with a job in the first place. Probably, they are obliged to do so, e.g., through external pressure. As we assume that extrinsically aspired individuals experience higher motivation by satisfying their need for relatedness, comparative feedback might work best for enhancing performance – this can be done in a very controlling way, e.g., by establishing performance-goals, providing hints about other's output, or rankings. The gamification of jobs in this bracket might even create intrinsic motivation. For intrinsically aspired individuals, gamification might be useful, too, however, it should not work through control, but instead evaluative instrumental feedback and comparative feedback if they are performing well. Here, the difference between the two categories lies in how gamification is achieved: for the first, through “beating the others”, while for the latter, the information on how to improve should result in “beating oneself”.

6.4 OPTIMAL TYPES OF FEEDBACK: VARYING DEFINITION OF OUTPUT OR PROCESS

With a different process or a lack of ex-ante defined output, setting goals becomes more difficult. Instead of arbitrarily defining goals, which, in the end, might even hinder optimal performance, incentives should focus on providing the individual with optimal arousal while being in the process of creating output.

6.4.1 HIGH INTRINSIC JOB VALUE

No matter the individual content of goals, here, individuals should receive immediate feedback if they are performing well. The striking difference is that the comparison does not function on an organization-wide level, but rather on the meso- and micro-level. If somebody in a job in this bracket performs a specific process or iteration of work particularly well, immediate positive feedback will foster the behavior and increase performance. Negative feedback should be used carefully, as the nature of the work might not allow for a high instrumental value. If the job requires creating unprecedented processes, the individual itself will be the first to derive whether they are performing well or not so well in a particular situation. Therefore, adding an external source of negative feedback to the internal source is unnecessary and will decrease performance.

6.4.2 LOW-MIDDLE INTRINSIC JOB VALUE

Extrinsically aspired individuals might benefit the most from comparative feedback, just as in the same bracket but for jobs with a precise definition of the process or output, but the dynamics of the job might create a sense of helplessness. Helplessness involves low perceived competence and autonomy, which harms job performance. Therefore, even extrinsically aspired

individuals should receive evaluative feedback, which they can use for reflection. Intrinsically motivated individuals should receive evaluative instrumental feedback, as well as comparative feedback if they are performing exceptionally well. Again, the same basic assumptions about the choice of rewards of extrinsic vs. intrinsic rewards apply.

6.4.3 LOW INTRINSIC JOB VALUE

Jobs in this bracket should use incentives to maximize the motivation-potential through extrinsic rewards. For extrinsically aspired individuals, this could be done through the use of highly comparative feedback, as, e.g., piece rates derived similarly to how it has been done through Scientific Management. Additionally, feedback could be provided in real-time to assure that performance is consistent. For intrinsically motivated individuals, the focus should be on highly evaluative feedback, i.e., focusing less on a team- or organization-wide performance, but, e.g., on their day-to-day performance. Again, the idea is to incentivize through “beating the others” vs. “beating oneself”. Relatively good performance, if consistent, can be rewarded through promotions.

6.5 PRACTICAL IMPLICATIONS

The derivation of optimal types of rewards provides categories, in which different approaches for incentives fit.

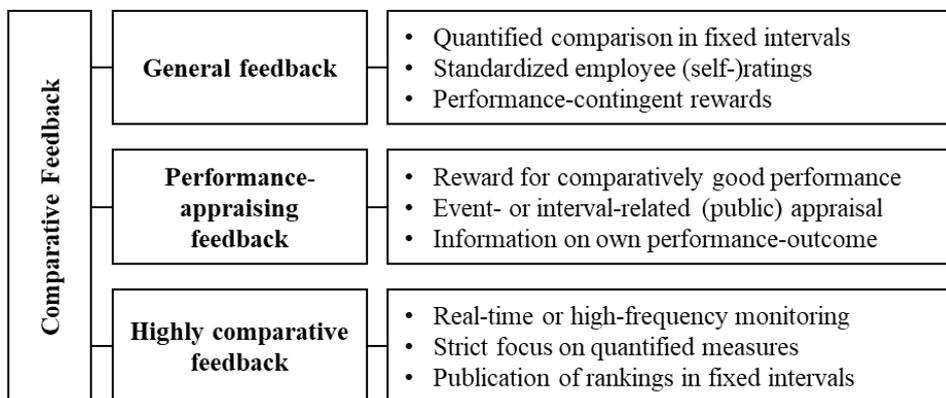


Figure 21 Examples of Comparative Feedback

The possibilities of designing the respective systems or types of incentives can be implemented individually in the organization. However, the respective characteristics of the types of feedback should be considered. Figure 21 shows examples of different aspects of feedback, which can be considered in the respective category.

For example, for general comparative feedback, quantitative measures can be used, which could be carried out at fixed intervals (e.g., weekly, monthly, annually, or project-related). In general, organizations use standardized evaluation forms for this purpose. For their optimal

applicability, these forms must, of course, correspond to the coordination tasks within the hierarchy, i.e., they must take into account the respective job characteristics. Furthermore, performance-contingent rewards could be used, which have an unmistakable comparative character and could be particularly useful for extrinsically oriented employees. The category of comparative feedback, which should only be used to underline desired and optimal performance, also includes performance-contingent rewards, but these do not necessarily have to be the result of quantified measures or a fixed interval. Instead, the aim is to establish a link between ideal performance and positive rewards, thereby reducing the negative consequences of performance-contingent rewards. These rewards should also be based on the intrinsic or extrinsic orientation of the individual. A performance-appraising reward informs not only the recipient of the reward but also their colleagues about which processes and outputs are considered optimal. Highly comparative feedback has a specific control character. Accordingly, (comparative) information could be provided to the employee in real-time or at very high intervals (e.g., twice a day). The focus here should be on quantified benchmarks since we assume that the performance of such processes is primarily based on speed and dexterity. The control factor could accordingly ensure that the average production speed is increased, and intrinsic break times (intentionally working slower) are reduced. Rankings could be used to increase the control factor from the individual to the organization, i.e., to introduce social control.

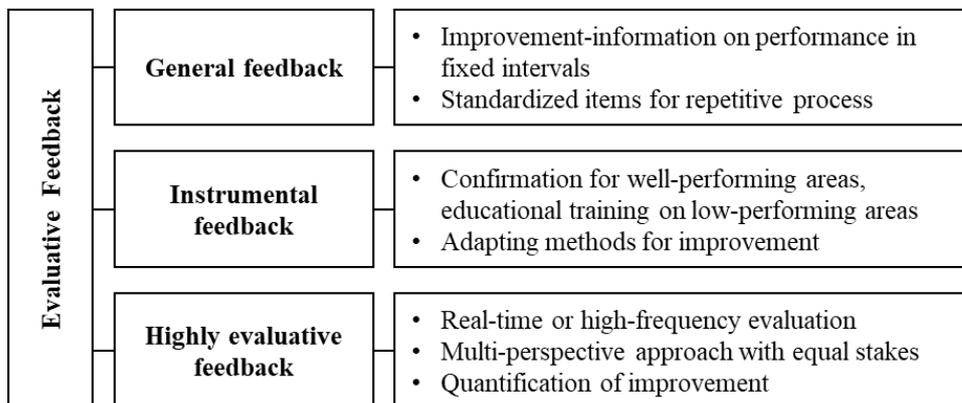


Figure 22 Examples of Evaluative Feedback

Figure 22 shows an overview of possible aspects of instruments that relate to evaluative feedback. In general, evaluative feedback should contain information for performance improvement, as has been discussed many times in this thesis. This feedback should be given at scheduled intervals. In order to maintain the interval and not to make the general workload too large, standardized surveys can be used.

Frontiers of Motivation Research on Feedback

For evaluative feedback with a specific focus on the instrumentality, the focus is on the areas in which the employee shows ideal performance. In order to reduce weaknesses, negative feedback should always be passed on with the possibility of improving it. For example, if an otherwise outstanding employee has problems in a specific area, the supervisor should take the time to explain the process anew in mutual exchange or develop tips and joint recommendations for action.

The highly evaluative feedback, like the highly comparative feedback, should be given at a very high frequency, or even in real-time. Also, a multi-perspective approach should be used, similar to 360°-feedback, but not with the aim of strategy setting, but to improve average performance. The agents who generate feedback, in this case, should be equally involved in the development of the employee, which means that negative feedback from one area should be taken just as seriously as negative feedback from another area. Ideally, improvements should be quantified so that the individual can assess their performance and also obtain information about their work between feedback intervals.

7. CASE STUDY: THE FEEDBACK SYSTEM AT X

This part of the thesis is marked with a blocking notice.

8. CONCLUSION

Over the centuries, motivation research expanded and received attention from a wide variety of academic disciplines. While the sheer number of publications and theories appears to diffuse, rather than unify, self-determination theory as a progressive approach provides direction and an empirically validated framework for future research. With the emergence of fMRI-studies in neurology, a promising academic discipline has joined the field. We are at the crossroads where these new disciplines are anew constructing fundamental theories that might impede scientific cooperation with other disciplines. This thesis demonstrates that first theorization in the field of neurology does not necessarily disprove existing motivation theories and that self-determination theory is constructed for constant adaption through novel insights. Besides the appearance of new disciplines in the field of motivation theory, this thesis also showed that several theories are constructed on similar grounds, and the dogmatic adhesion to preferred theories does not support research. With the involvement of neurological research, it is potentially possible that the debate on behavioral theories will now retreat into the background, and validation will be a priority.

Furthermore, the motivation-potential model of feedback (MPMF) provides a framework for clarification regarding the structural analysis of feedback processes, as well as the implementation of feedback-tools in organizations. Here, the differentiation based on the organizational macro-, meso-, and micro-level, as well as the distinction between feedback as a coordination or motivation instrument synthesizes economic with organizational research. The framework suits all organizational studies, as far as the organizational problem applies.

The case study suggests how to apply self-determination theory combined with neurological concepts to practical problem sets. This application might be the first of its kind, especially with the combination of internal survey data and a quantitative analysis of qualitative data, and demonstrates the capabilities of interdisciplinary research.

8.1 MANAGERIAL IMPLICATIONS

From a theory-building point of view, this thesis does not add to the managerial implications of applying self-determination theory or basic psychological needs satisfaction to business processes but amplifies it. Researchers and practitioners have repeatedly proven the positive effects of correctly applying rewards and feedback for optimally motivating results.

Regarding the implementation of optimal feedback processes in organizations, the motivation-potential model of feedback provides a systematic approach for the assessment and

development of feedback-tools. As the model is intended to be a broader framework, new insights regarding motivation theories or novel methods of providing feedback can be integrated. The insight that in business processes psychological factors, as well as economic factors, must be taken into account is not surprising – yet, in practice, managers are still prone to conventional economic theory.

8.2 LIMITATIONS

In the part of this thesis discussing motivation theories, mostly need-based theories are considered. The reasoning for this approach is explained in the respective chapter and stems from empiric validation or the historical importance of the theory. While the cornerstone-theory of this thesis, self-determination theory, is empirically validated in most parts, the framework is still emerging and should not be understood as final. Especially its root in education and the focus on quantitative evidence limits its present validity. The literature on applying self-determination theory as an ex-ante tool for anticipating motivational effects is limited. Therefore, this approach should be used as a proposal rather than a proven concept for future research.

The presented neurological findings in this study stem from rather recent studies and have received less discussion in motivation research than their behavioral counterparts. Reasons for that could be that the community surrounding neurological research on motivation is still evolving or that a majority of motivation researchers lack the deep medical expertise to judge methodology or interpretation of results – the author of this thesis included. Nevertheless, the integration and validation of findings from neurology in motivation research can be done by comparison of findings with existing empirically validated motivation theories, as this thesis suggests.

While the chapter on feedback explores existing frameworks and includes case studies from organizations, the MPMF is a high-level framework and requires further clarification. As presented in this thesis, the model can be used for the development of feedback processes in organizations to solve the organizational problem. However, its application as a research framework is out of the scope of this thesis.

8.3 SUGGESTIONS FOR FUTURE RESEARCH

After years of parallel development of theories and approaches, motivation research should focus on harmonization and validation. Self-determination theory is an excellent way of demonstrating how a unifying theory allows constant updating and change without requiring

fundamental reconception. It also allows incorporation of insights from neurology and possibly other academic disciplines. However, this can only be achieved if both the dominant academic disciplines in motivation research (such as psychology) would also step in the direction of neurology and if neurology carefully incorporates existing theories and takes them into account in studies. The second recommendation relates, in particular, to management and business research. This thesis has highlighted how powerful the influence of principal-agent theory and scientific management has been and still is in the field of management. Motivation research has reasonably proven that these practices are suboptimal for a multitude of present-day organizations. A Copernican turn, which declares these approaches to be inadequately informed, is overdue. Self-determination theory offers the opportunity to construct a differentiated and complex alternative concept to homo oeconomicus. Finally, it is proposed to validate and discuss the possibility of ex-ante consideration of motivating effects in processes. While a proposal has already been made in this thesis, it is based on an ex-post consideration. Achieving validation of ex-ante anticipation of motivating effects could be done, for example, through experimental studies, which design processes based on basic psychological needs satisfaction, followed by measurement.

We can derive three suggestions: (1) regarding self-determination theory, a meta-analysis regarding its application across the different fields of academic research could provide clarity towards its roots in education. (2) Regarding the MPMF, a thorough comparison of the model to the existing literature on management control systems could enhance the validity of the model. Furthermore, an explorative study surveying present-day used feedback-systems with subsequent theorization on the findings could provide a different but work-life-oriented framework. (3) The quantification of self-determination theory requires further discussion within the field of motivation research. Potentially, there are drawbacks, which should be gauged with its facilitation of quantitative analysis. We have encapsulated the opportunities and magnitude of challenges coming with synthesizing motivation research. First steps are always shaky, but someday they allow us to run.

REFERENCES

- Aalai, A. (2015, November 20). *Rethinking John B. Watson's Legacy*. Retrieved February 20, 2020, from Psychology Today: <https://www.psychologytoday.com/us/blog/the-first-impression/201511/rethinking-john-b-watsons-legacy>
- Abramson, L. Y., Seligman, M. E., & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology, 87*(1), pp. 49-74. doi:10.1037/0021-843X.87.1.49
- Abulof, U. (2017, November 15). Introduction: Why We Need Maslow in the Twenty-First Century. *Society, 54*, pp. 508-509. doi:10.1007/s12115-017-0198-6
- Aelterman, N., Vansteenkiste, M., Haerens, L., Soenens, B., Fontaine, J. R., & Reeve, J. (2019). Toward an integrative and fine-grained insight in motivating and demotivating teaching styles: The merits of circumplex approach. *Educational Psychology, 111*(3), pp. 497-521. doi:10.1037/edu0000293
- Aguado, L. (2003, December). Neuroscience of Pavlovian Conditioning: A Brief Review. *The Spanish Journal of Psychology, 6*(2), pp. 155-167. doi:10.1017/S1138741600005308
- Alderfer, C. P. (1969, May). An empirical test of a new theory of human needs. *Organizational Behavior and Human Performance, 4*(2), pp. 142-175. doi:10.1016/0030-5073(69)90004-X
- American Psychological Association. (2017, January 1). *Ethical Principles of Psychologists and Code of Conduct Including 2010 and 2016 Amendments*. Retrieved February 23, 2020, from American Psychological Association: <https://www.apa.org/ethics/code/>
- American Psychological Association. (2018). *Crespi effect*. Retrieved February 10, 2020, from American Psychological Association Dictionary: <https://dictionary.apa.org/crespi-effect>
- American Psychological Association. (2018). *Fundamental Attribution Error*. Retrieved February 28, 2020, from American Psychological Association: <https://dictionary.apa.org/fundamental-attribution-error>
- American Psychological Association. (2018). *Introjection*. Retrieved March 03, 2020, from American Psychological Association: <https://dictionary.apa.org/introjection>

- American Psychological Association. (2018). *Law of effect*. Retrieved February 24, 2020, from American Psychological Association: <https://dictionary.apa.org/law-of-effect>
- American Psychological Association. (2018). *Self-serving bias*. Retrieved from American Psychological Association: <https://dictionary.apa.org/self-serving-bias>
- Amunts, K., Kedo, O., Kindler, M., Pieperhoff, P., Mohlberg, H., Shah, N. J., . . . Zilles, K. (2005, January). Cytoarchitectonic mapping of the human amygdala, hippocampal region and entorhinal cortex: intersubject variability and probability maps. *Anatomy and Embryology*, 5-6, pp. 343-352. doi:10.1007/s00429-005-0025-5
- Araiba, S. (2019, June 10). Current Diversification of Behaviorism. *Perspectives on Behavior Science*. doi:10.1007/s40614-019-00207-0
- Aron, A. R., Shohamy, D., J, C., Myers, C., A, G. M., & Poldrack, R. A. (2004, August). Human midbrain sensitivity to cognitive feedback and uncertainty during classification learning. *Journal of neurophysiology*, 92(2), pp. 1144-1152. doi:10.1152/jn.01209.2003
- Ashby, F. G., Valentin, V. V., & Turken, U. (2002). The effects of positive affect and arousal on working memory and executive attention: Neurobiology and computational models. In S. Moore, & M. Oaksford, *Emotional Cognition: From Brain to Behavior* (pp. 245-287). Amsterdam: John Benjamins.
- Atkinson, J. W. (1964). *An Introduction to Motivation*. Princeton: Van Nostrand.
- Atkinson, J. W., & McClelland, D. C. (1948). The projective expression of needs. II. The effect of different intensities of the hunger drive on Thematic Apperception. *Journal of Experimental Psychology*, 38(6), pp. 643-658. doi:10.1037/h0061442
- Baard, P. P., Deci, E. L., & Ryan, R. M. (2004, October). Intrinsic Need Satisfaction: A Motivational Basis of Performance and Well-Being in Two Work Settings. *Journal of Applied Social Psychology*, 34(10), pp. 2045-2068. doi:10.1111/j.1559-1816.2004.tb02690.x
- Backer, S. C., Frith, C. D., & Dolan, R. J. (1997, May). The interaction between mood and cognitive function studied with PET. *Psychological Medicine*, 27(3), pp. 565-578. doi:10.1017/s0033291797004856
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs: Prentice-Hall.

- Bandura, A. (1989). Social Cognitive Theory. In R. Vasta, *Annals of child development. Vol. 6. Six theories of child development* (pp. 1-60). Greenwich: JAI Press. Retrieved from <https://www.uky.edu/~eushe2/Bandura/Bandura1989ACD.pdf>
- Bandura, A. (1991, December). Social Cognitive Theory of Self-Regulation. *Organizational Behavior and Human Decision Processes*, 50(2), pp. 248-287. doi:10.1016/0749-5978(91)90022-L
- Bandura, A. (1997). Self-efficacy. *Harvard Mental Health Letter*, pp. 4-7.
- Bandura, A., & Cervone, D. (1983, November). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology*, 45(5), pp. 1017-1028. doi:10.1037/0022-3514.45.5.1017
- Bar, M. (2009, May 12). The proactive brain: memory for predictions. *Philosophical Transactions of The Royal Society B Biological Sciences*, 364(1521), pp. 1235-1243. doi:10.1098/rstb.2008.0310
- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of Social Behavior: Direct Effects of Trait Construct and Stereotype Activation on Action. *Journal of Personality and Social Psychology*, 71(2), pp. 230-244. doi:10.1037//0022-3514.71.2.230
- Barnette, J. J., & McLean, J. E. (2005, November). Type I Error Of Four Pairwise Mean Comparison Procedures Conducted As Protected and Unprotected Tests. *Journal of Modern Applied Statistical Methods*, 4(2), pp. 446-459. doi:10.22237/jmasm/1130803740
- Bartholomew, A. (2013, December). Behaviorism's Impact on Advertising: Then and Now. *Theses from the College of Journalism and Mass Communication*(37). Retrieved from <https://digitalcommons.unl.edu/journalismdiss/37/>
- Bass, B. M., & Avolio, B. J. (1990). *Transformational Leadership Development: Manual for the Multifactor Leadership Questionnaire*. Palo Alto: Consulting Psychologists Press.
- Bassim, M. N. (2014). 8.11 - Economic Implications of Impact of Manufacturing on Environment and Health. In S. Hashmi, G. F. Batala, C. J. van Tyne, & B. Yilbas, *Comprehensive Materials Processing* (8 ed., pp. 199-210). Elsevier Ltd. doi:10.1016/B978-0-08-096532-1.00817-7

- Baumeister, R., & Leary, M. (1995, June). The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Motivation. *Psychological Bulletin*, 117(3), pp. 497-529. doi:10.1037/0033-2909.117.3.497
- Beck, H., & Irons, G. (2011). Finding Little Albert. *The Psychologist*(24), pp. 392-395.
- Bénabou, R., & Tirole, J. (2003, July 01). Intrinsic and extrinsic motivation. *The Review of Economics Studies*, 70(3), pp. 489-520. doi:10.1111/1467-937X.00253
- Berridge, K. (2004, April 8). Motivation concepts in behavioral neuroscience. *Physiological Behavior*, 81(2), pp. 179-209. doi:10.1016/j.physbeh.2004.02.004
- Berridge, K., & Kringelbach, M. (2008, August). Affective neuroscience of pleasure: reward in humans and animals. *Psychopharmacology*, 199(3), pp. 457-480. doi:10.1007/s00213-008-1099-6
- Betts, J. G., Desaix, P., Johnson, E., Johnson, J. E., Korol, O., Kruse, D., . . . Young, K. A. (2017). *Anatomy & physiology*. Houston, TX: OpenStax College, Rice University.
- Biglan, A. (1987, Spring). A behavior-analytic critique of Bandura's self-efficacy theory. *Behavior Analysis*(10), pp. 1-15. doi:10.1007/bf03392402
- Bindra, D. (1985). Motivation, the brain, and psychological theory. In S. Koch, & D. E. Leary, *A century of psychology as science* (pp. 338-363).
- Biscontini, T. (2020). *Flow (Psychology)*. Salem Press Encyclopedia.
- Bolles, R. C. (1990, March 1). Where Did Everybody Go? *Psychological Science*, 1(2), pp. 107-113. doi:https://doi.org/10.1111/j.1467-9280.1990.tb00077.x
- Boren, J. J., & Devine, D. D. (1968, November). The repeated acquisition of behavioral chains. *Journal of the Experimental Analysis of Behavior*(11), pp. 651-660. doi:10.1901/jeab.1968.11-651
- Brehm, J. W., & Self, E. A. (1989, February). The Intensity of Motivation. *Annual Review of Psychology*, 40, pp. 109-131. doi:10.1146/annurev.ps.40.020189.000545
- Brink, T. L. (2008). Unit 6: Learning. In *Psychology: A Student Friendly Approach* (pp. 97-98). San Bernardino: San Bernardino Community College District.
- Brophy, J. E. (1998). *Motivating students to learn*. Boston: McGraw-Hill.

- Brown, B., Gude, W. T., Blakeman, T., van der Veer, S. N., Ivers, N., Francis, J. J., . . . Daker-White, G. (2019, April 26). Clinical Performance Feedback Intervention Theory (CP-FIT): a new theory for designing, implementing, and evaluating feedback in health care based on a systematic review and meta-synthesis of qualitative research. *Implementation Science, 14*(40). doi:10.1186/s13012-019-0883-5
- Buckingham, M., & Goodall, A. (2015, April). Reinventing Performance Management. *Harvard Business Review*, pp. 40-50.
- Burgers, C., Eden, A., van Engelenburg, M. D., & Buningh, S. (2015, February 10). How feedback boosts motivation and play in a brain-training game. *Computers in Human Behaviour, 48*, pp. 94-103. doi:10.1016/j.chb.2015.01.038
- Burnahm, J. F. (2006, March 08). Scopus database: a review. *Biomedical Digital Libraries, 3*(1). doi:10.1186/1742-5581-3-1
- Burnes, B., & Cooke, B. (2013). Kurt Lewin's Field Theory: A Review and Re-evaluation. *International Journal of Management Reviews, 15*(4), pp. 408-425. doi:10.1111/j.1468-2370.2012.00348
- Bush, G., Vogt, B. A., Holmes, J., Dale, A. M., Greven, D., Jenike, M. A., & Rosen, B. R. (2001, December 26). Dorsal anterior cingulate cortex: A role in reward-based decision making. *Proceedings of the National Academy of Sciences* , pp. 523-528. doi:10.1073/pnas.012470999
- Buunk, B. P., & Van Yperen, N. W. (1991). Referential comparisons, relational comparisons, and exchange orientation: Their relation to marital satisfaction. *Personality and Social Psychology Bulletin, 17*(6), pp. 709-717. doi:10.1177/0146167291176015
- Cambridge International Education Teaching and Learning Team. (2020). *Getting started with Metacognition*. Retrieved April 22, 2020, from Cambridge Assessment International Education: <https://cambridge-community.org.uk/professional-development/gswmeta/index.html>
- Canary, D. J., & Spitzberg, B. H. (1990). Attribution biases and associations between conflict strategies and competence outcomes. *Communication Monographs, 57*(2), pp. 139-151. doi:10.1080/03637759009376191
- Cannon, W. B. (1932). *The wisdom of the body*. University of California: W.W. Norton & Company, inc.

- Caplan, G. (1990, February). Loss, stress, and mental health. *Community Mental Health Journal*, 26(1), pp. 27-48. doi:10.1007/bf00752675
- Cardinal, R. N., Parkinson, J. A., Hall, J., & Everitt, B. J. (2002, May). Emotion and motivation: the role of the amygdala, ventral striatum, and prefrontal cortex. *Neuroscience and biobehavioral reviews*, 26(3), pp. 321-352. doi:10.1016/s0149-7634(02)00007-6
- Carifio, J., & Perla, R. J. (2007, March). Ten Common Misunderstandings, Misconceptions, Persistent Myths and Urban Legends about Likert Scales and Likert Response Formats and their Antidotes. *Journal of Social Sciences*, 3(3), pp. 106-116. doi:10.3844/jssp.2007.106.116
- Carnevale, P. J., & Isen, A. M. (1986, February). The influence of positive affect and visual access on the discovery of integrative solutions in bilateral negotiation. *Organizational Behavior and Human Decision Processes*, 37(1), pp. 1-13. doi:10.1016/0749-5978(86)90041-5
- Carpentier, J., & Mageau, G. A. (2013, January 22). When change-oriented feedback enhances motivation, well-being and performance: A look at autonomy-supportive feedback in sport. *Psychology of Sport and Exercise*, 14(3), pp. 423-435. doi:10.1016/j.psychsport.2013.01.003
- Carver, C. S., & Scheier, M. F. (2012). Cybernetic Control Processes and the Self-Regulation of Behavior. In R. M. Ryan, *The Oxford Handbook of Human Motivation*. Oxford University Press. doi:10.1093/oxfordhb/9780195399820.013.0003
- Cassone, V. M., & Kumar, V. (2015). Chapter 34 - Circadian Rhythms. In C. G. Scanes, & C. G. Scanes (Ed.), *Sturkie's Avian Psychology* (6 ed., pp. 811-827). Academic Press. doi:10.1016/B978-0-12-407160-5.00034-8
- Center for Self-Determination Theory. (2020). *Intrinsic Motivation Inventory (IMI)*. Retrieved May 08, 202, from CSDT: <https://selfdeterminationtheory.org/intrinsic-motivation-inventory/>
- Chance, P. (2014). Pavlovian Conditioning. In P. Chance, *Learning and Behavior: Active Learning Edition* (pp. 69-80). Belmont, CA: Wadsworth Cengage Learning.
- Chang, R. C., Stout, S., & Miller, R. R. (2004, February). Comparing excitatory backward and forward conditioning. *The Quarterly Journal of Experimental Psychology*, 1(57), pp. 1-23. doi:10.1080/02724990344000015

- Chen, X., & Latham, G. P. (2014, November). The effect of priming learning vs. performance goals on a complex task. *Organizational Behavior and Human Decision Processes*, 125(2), pp. 88-97. doi:10.1016/j.obhdp.2014.06.004
- Cheng, K. H., Hui, C. H., & Cascio, W. F. (2017, April 10). Leniency Bias in Performance Ratings: The Big-Five Correlates. *Frontiers in Psychology*, 5(521). doi:10.3389/fpsyg.2017.00521
- Cherry, K. (2018, May 09). *Mihaly Csikszentmihalyi Biography*. Retrieved March 04, 2020, from verywellmind: <https://www.verywellmind.com/mihaly-csikszentmihalyi-biography-2795517>
- Cherry, K., & Gans, S. (2019, May 14). *The Difference Between the Classical and Operant Conditioning*. Retrieved February 23, 2020, from verywellmind: <https://www.verywellmind.com/classical-vs-operant-conditioning-2794861>
- Cherry, K., & Gans, S. (2019, September 05). *What Is Operant Conditioning and How Does It Work?* Retrieved February 23, 2020, from verywellmind: <https://www.verywellmind.com/operant-conditioning-a2-2794863>
- Chiviawowsky, S., & Wulf, G. (2007). Feedback After Good Trials Enhances Learning. *Research Quarterly for Exercise and Sport*, 78(1), pp. 40-47. doi: 10.1080/02701367.2007.10599402
- Choudhary, V., Shunko, M., & Netessine, S. (2018, October 28). Does Real-time Feedback Make You Try Less Hard? A Study of Automotive Telematics. *INSEAD Working Paper No. 2020/05/TOM*. doi:10.2139/ssrn.3260891
- Chua, H. L., Lee, S. H., & Fulmer, G. W. (2017). Action research on the effect of descriptive and evaluative feedback order on student learning in a specialized mathematics and science secondary school. *Asia-Pacific Science Education*, 3(4). doi:10.1186/s41029-017-0015-y
- Cianci, A. M., Klein, H. J., & Seijt, G. (2010, July). The Effect of Negative Feedback on Tension and Subsequent Performance: The Main and Interactive Effects of Goal Content and Conscientiousness. *Journal of Applied Psychology*, 95(4), pp. 618-630. doi:10.1037/a0019130

- Cohn, M. A., Mehl, M. R., & Pennebaker, J. W. (2004, October 1). Linguistic Markers of Psychological Change Surrounding September 11, 2001. *Psychological Science*, *15*(10), pp. 687-693. doi:10.1111/j.0956-7976.2004.00741.x
- Colwill, R. M., & Rescorla, R. A. (1985). Instrumental responding remains sensitive to reinforcer devaluation after extensive training. *Journal of Experimental Psychology: Animal Behavior Processes*, *4*(11), pp. 520-536. doi:10.1037/0097-7403.11.4.520
- Conradi, K., Jang, B. G., & Mckenna, M. C. (2014, March). Motivation Terminology in Reading Research: A Conceptual Review. *Educational Psychology Review*, pp. 127-164. doi:10.1007/s10648-013-9245-z
- Coombs, C. H., Dawes, R. M., & Tversky, A. (1970). *Mathematical psychology; an elementary introduction*. Englewood Cliffs: Prentice-Hall.
- Coon, D., & Mitterer, J. O. (2015). *Introduction To Psychology: gateways to mind and behavior* (14 ed.). Cengage Learning.
- Cooper, J. M. (1984, January). Plato's Theory of Human Motivation. *History of Philosophy Quarterly*, *1*(1), pp. 3-21. Retrieved February 09, 2020, from www.jstor.org/stable/27743663
- Cowan, N. (2015, July). George Miller's Magical Number of Immediate Memory in Retrospect: Observations on the Faltering Progression of Science. *Psychological Review*, *122*(3), pp. 536-541. doi:10.1037/a0039035
- Crtichley, H. D., Corfield, D. R., Changler, M. P., Mathias, C. J., & Dolan, R. J. (2000, February 15). Cerebral correlates of autonomic cardiovascular arousal: a functional neuroimaging investigation in humans. *The Journal of Physiology*, *523*(1), pp. 259-270. doi:10.1111/j.1469-7793.2000.t01-1-00259.x
- Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. Harper & Row.
- Csikszentmihalyi, M., Abuhamdeh, S., & Nakamura, J. (2005). Flow. In A. J. Elliot, & C. S. Dweck, *Handbook of Competence and Motivation* (pp. 598-608). New York: The Guildford Press.
- Damasio, A. R., Tranel, D., & Damasio, H. C. (1991). Somatic Markers and the Guidance of Behavior: Theory and Preliminary Testing. In H. S. Levin, & H. M. Eisenberg, *Frontal Lobe Function and Dysfunction* (pp. 217-227). Oxford University Press.

- Darwin, C. (1859). *On the origin of species by means of natural selection, or preservation of favoured races in the struggle for life*. London: John Murray. Retrieved from <http://darwin-online.org.uk/content/frameset?pageseq=1&itemID=F391&viewtype=side>
- Dashiell, J. F. (1925). A quantitative demonstration of animal drive. *Journal of Comparative Psychology*, 5(3), pp. 205-208. doi:10.1037/h0071833
- Davey, G. C. (1998). 1.13 - Learning Theory. In A. S. Bellack, & M. Hersen, *Comprehensive Clinical Psychology* (pp. 391-421). Pergamon. doi:10.1016/B0080-4270(73)00181-4
- de Bilde, J., Vansteenkiste, M., & Lens, W. (2011). Understanding the association between future time perspective and self-regulated learning through the lens of self-determination theory. *Learning and Instruction*, 21, pp. 332-344. doi:10.1016/j.learninstruc.2010.03.002
- de Charms, R. (1968). *Personal Causation: The Internal Affective Determinants of Behavior*. University of Michigan: Academic Press.
- de Charms, R. (1983). *Personal Causation: The Internal Affective Determinants of Behavior*. Routledge.
- Decety, J., & Jackson, P. L. (2004, June 01). The Functional Architecture of Human Empathy. *Behavioral and Cognitive Neuroscience Review*, 2, pp. 71-100. doi:10.1177/1534582304267187
- deCharms, R. (1983). *Personal Causation: The Internal Affective Determinants of Behavior*. Routledge.
- Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18(1), pp. 105-115. doi:10.1037/h0030644
- Deci, E. L. (1972, April). Intrinsic Motivation, Extrinsic Reinforcement, and Inequity. *Journal of Personality and Social Personality*, 22(1), pp. 113-120. doi:10.1037/h0032355
- Deci, E. L. (1975). *Intrinsic motivation*. New York: Plenum Press.
- Deci, E. L., & Ryan, R. M. (1980). The Empirical Exploration of Intrinsic Motivational Processes. In L. Berkowitz, *Advances in Experimental Social Psychology* (Vol. 13, pp. 39-80). New York: Academic Press. doi:10.1016/S0065-2601(08)60130-6

- Deci, E. L., & Ryan, R. M. (1985, June). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*(2), pp. 109-134. doi:10.1016/0092-6566(85)90023-6
- Deci, E. L., & Ryan, R. M. (2000, October). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry, 11*(4), pp. 227-268. doi:10.1207/S15327965PLI1104_01
- Deci, E. L., & Ryan, R. M. (2000, October). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry, 11*(4), pp. 227-268. doi:10.1207/S15327965PLI1104_01
- Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology/Psychologie canadienne, 1*, pp. 14-23. doi:10.1037/0708-5591.49.1.14
- Deci, E. L., & Ryan, R. M. (2014). Autonomy and Need Satisfaction in Close Relationships: Relationships Motivation Theory. In N. Weinstein, *Human Motivation and Interpersonal Relationships* (pp. 53-73). Dordrecht: Springer. doi:10.1007/978-94-017-8542-6
- Deci, E. L., & Ryan, R. M. (2014). The importance of universal psychological needs for understanding motivation in the workplace. In M. Gagné, *The Oxford handbook of work engagement, motivation, and self-determination theory* (pp. 13-32). Oxford: Oxford University Press.
- Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of Applied Psychology, 74*(4), pp. 580-590. doi:10.1037/0021-9010.74.4.580
- Deci, E. L., Koestner, R., & Ryan, R. M. (1999, December). A Meta-Analytic Review of Experiments Examining the Effect of Extrinsic Rewards on Intrinsic Motivation. *Psychological Bulletin, 125*(6), pp. 692-700. doi:10.1037/0033-2909.125.6.627
- Deci, E. L., Ryan, R. M., Gagné, M., Leone, D. R., Usunov, J., & Kornazheva, B. P. (2001, August). Need Satisfaction, Motivation, and Well-Being in the Work Organizations of a Former Eastern Bloc Country: A Cross-Cultural Study of Self-Determination. *Personality and Social Psychology Bulletin, 27*(8), pp. 930-942. doi:10.1177/0146167201278002

- Detzen, D., & Loehlein, L. (2018, September 17). Language at work in the Big Four: global aspirations and local segmentation. *Accounting, Auditing, & Accountability Journal*, 31(7), pp. 2031-2054. doi:10.1108/AAAJ-06-2017-2968
- Deutsch, M. (1954). Field Theory in Social Psychology. In G. Lindzey, & E. Aronson (Eds.), *The Handbook of Social Psychology* (2 ed., pp. 412-487). Cambridge: Addison-Wesley.
- Dewey, R. A. (2017). Chapter 9: Motivation and Emotion Part One: Biological Motives: Hull's Theory. In R. A. Dewey, *Psychology: An Introduction*. Retrieved from <https://www.psywww.com/intropsych/index.html>
- DeYoung, C. G. (2013, November 14). The neuromodulator of exploration: A unifying theory of the role of dopamine in personality. *Frontiers in Human Neuroscience*. doi:10.3389/fnhum.2013.00762
- Di Domenico, S. I., & Ryan, R. M. (2017, March 24). The Emerging Neuroscience of Intrinsic Motivation: A New Frontier in Self-Determination Research. *Frontiers in Human Neuroscience*. doi:10.3389/fnhum.2017.00145
- Die Zeit. (1950, January 5). Albert Einsteins universale Feldtheorie. *Die Zeit*. Retrieved from <https://www.zeit.de/1950/01/albert-einsteins-universale-feldtheorie>
- Dilts, R. (1998). *The Article of the Month by Robert Dilts*. Retrieved February 09, 2020, from Motivation: <http://www.nlpu.com/Articles/artic17.htm>
- Dodge, K. A. (1980, March). Social cognition and children's aggressive behavior. *Child Development*, 51(1), pp. 162-170. Retrieved from <https://www.jstor.org/stable/1129603>
- Doher, P. (2018). *Three-term Contingency*. Retrieved February 25, 2020, from ABA: Applied Behavior Analysis: <http://abaappliedbehavioranalysis.weebly.com/three-term-contingency.html>
- Doshi, N., & McGregor, L. (2015). *Primed to perform: how to build the highest performing cultures through the science of total motivation*. New York: Harper Business.
- Dowding, D., Merrill, J., & Russell, D. (2018, December 05). Using Feedback Intervention Theory to Guide Clinical Dashboard Design. *AMIA Annual Symposium Proceedings Archive*, pp. 395-403.
- Drucker, P. F. (1954). *The Practice of Management*. New York: Harper & Row.

- Duffy, R. D., Diemer, M. A., Perry, J. C., Laurenzi, C., & Torrey, C. L. (2012, April). The construction and initial validation of the Work Volition Scale. *Journal of Vocational Behavior, 80*(2), pp. 400-411. doi:10.1016/j.jvb.2011.04.002
- Duffy, R. D., Jadidian, A., Douglass, R. P., & Blake, A. A. (2015, May). Work Volition Among U.S. Veterans: Locus of Control as a Mediator. *The Counseling Psychologist, 43*(6), pp. 1-26. doi:10.1177/0011000015576800
- Dunn, R., & Fantino, E. (1982, November). Choice and the relative immediacy of reinforcement. *Journal of the Experimental Analysis of Behavior, 38*(3), pp. 321-326. doi:10.1901/jeab.1982.38-321
- Ebbinghaus, H. (1885). *Memory - A Contribution to Experimental Psychology*. New York City: Teachers College, Columbia University. Retrieved from <https://archive.org/details/memorycontributi00ebbiuoft/page/n6/mode/2up>
- Einhorn, H. J., & Hogarth, R. M. (1986, January). Judging probable cause. *Psychological Bulletin*(99), pp. 3-19. doi:10.1037/0033-2909.99.1.3
- Eisneberger, N. I., Lieberman, M. D., & Williams, K. D. (2003, October 10). Does rejection hurt? An fMRI study of social exclusion. *Science, 302*(5643), pp. 290-292. doi:10.1126/science.1089134
- Elman, I., & Borsook, D. (2018, February 20). Threat Response System: Parallel Brain Processes in Pain vis-à-vis Fear and Anxiety. *Frontiers in Psychiatry*. doi:10.3389/fpsy.2018.00029
- Encyclopaedia Britannica. (2015, May 4). *Conditioning*. (I. Encyclopædia Britannica, Editor, & T. E. Britannica, Producer) Retrieved February 25, 2020, from Encyclopaedia Britannica: <https://www.britannica.com/science/conditioning>
- Encyclopædia Britannica. (2019, November 28). *Gestalt psychology*. (I. Encyclopædia Britannica, Editor) Retrieved January 26, 2020, from Encyclopædia Britannica: <https://www.britannica.com/science/Gestalt-psychology>
- Engeser, S., & Rheinberg, F. (2008, September 09). Flow, performance and moderators of challenge-skill balance. *Motivation and Emotion, 32*(2), pp. 158-172. doi:10.1007/s11031-008-9102-4

- Equilar Inc. (2017, May 23). *Equilar*. Retrieved April 22, 2020, from Equilar & Associated Press CEO Pay Study 2017: <https://www.equilar.com/reports/48-associated-press-ceo-pay-study-2017>
- Eubanks, L., Wright, R. A., & Williams, B. J. (2002). Reward Influence on the Heart: Cardiovascular Response as a Function of Incentive Value at Five Levels of Task Demand. *Motivation and Emotion*, 26, pp. 139-152. doi:10.1023/A:1019863318803
- Evans, D. (2002, July). Database searches for qualitative research. *Journal of the Medical Library Association*, 90(3), pp. 290-293. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC116400/>
- Facteau, J. D., & Craig, S. B. (2001, April). Are performance appraisal ratings from different rating sources comparable? *Journal of Applied Psychology*, 86(2), pp. 215-227. doi:10.1037/0021-9010.86.2.215
- Faculty of Humanities and Social Sciences Athabasca University. (2019, March). *Concept Definition: Temporal Conditioning*. Retrieved February 23, 2020, from Psychology Learning Resources: Ivan Pavlov and Pavlovian Conditioning: <https://psych.athabascau.ca/open/pavlov/temporal.php>
- Falcon, A. (2019, Spring Edition). *Aristotle on Causality*. (E. N. Zalta, Editor, & Metaphysics Research Lab, Stanford University) Retrieved February 02, 2020, from The Stanford Encyclopedia of Philosophy: <https://plato.stanford.edu/archives/spr2019/entries/aristotle-causality>
- Fall, A., & Roussel, P. (2014). Compensation and Work Motivation: Self-Determination Theory and the Paradigm of Motivation through Incentives. In M. Gagné, *The Oxford Handbook of Work Engagement, Motivation, and Self-Determination Theory*. Oxford: Oxford University Press.
- Farrer, C., Franck, N., Georgieff, N., Frith, C. D., Decety, J., & M, J. (2003, February). Modulating the experience of agency: a positron emission tomography study. *NeuroImage*, 18(2), pp. 324-333. doi:10.1016/s1053-8119(02)00041-1
- Feather, N. T. (1988, September). Values, valences, and course enrollment: Testing the role of personal values within an expectancy-valence framework. *Journal of Educational Psychology*, 80(3), pp. 381-391. doi:10.1037/0022-0663.80.3.381

- Ferster, C. B., & Skinner, B. F. (1957). *Schedules of Reinforcement*. New York: Appleton-Century-Crofts.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford: Stanford University Press.
- Fincham, J. M., & Anderson, J. R. (2006, August 22). Distinct roles of the anterior cingulate and prefrontal cortex in the acquisition and performance of a cognitive skill. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(34), pp. 12941-12946. doi:10.1073/pnas.0605493103
- Fischer, D. B., Boes, A. D., Demertzi, A., Evrard, H. C., Laureys, S., Edlow, B. L., . . . Geerling, J. C. (2016, December 6). A human brain network derived from coma-causing brainstem lesions. *Neurology*, *87*(23), pp. 2427-2434. doi:10.1212/WNL.0000000000003404
- Flechtner, H. J. (1972). *Grundbegriffe der Kybernetik*. Hirzel.
- Forest, J., Gilbert, M., Beaulieu, G., Lebrock, P., & Gagné, M. (2014). Translating Research Results in Economic Terms: An Application of Economic Utility Analysis Using SDT-Based Interventions. In M. Gagné, *The Oxford Handbook of Work Engagement, Motivation, and Self-Determination Theory* (pp. 335-346). Oxford: Oxford University Press.
- forsa Politik- und Sozialforschung GmbH. (2019). *dbb Bürgerbefragung Öffentlicher Dienst*. dbb beatmenbund und tarifunion. Retrieved May 05, 2020, from https://www.dbb.de/fileadmin/pdfs/2019/forsa_2019.pdf
- Franzoi, S. L. (2015). *Psychology: A Discovery Experience*. Mason: South-Western Cengage Learning.
- Freud, S. (1915). *Triebe und Tribschicksale*.
- Freud, S. (1920). *Jenseits des Lustprinzips*.
- Freud, S. (1999). *The Standard Edition of the Complete Psychological Works of Sigmund Freud* (Vol. XIX). London: Hogarth Press.
- Friedman, H. H., Wilamowsky, Y., & Friedman, L. W. (1981, Summer). A Comparison of Balanced and Unbalanced Rating Scales. *The Mid-Atlantic Journal of Business*, *19*(2), pp. 1-7.

- Funke, J. (2003). *Unterrichtsmaterialien zur Vorlesung Allgemeine Psychologie*. Heidelberg: Psychologisches Institut, Ruprecht-Karls-Universität Heidelberg. Retrieved February 11, 2020, from Allgemeine & Theoretische Psychologie: <http://www.psychologie.uni-heidelberg.de/ae/allg/lehre/wct/index.htm>
- Fusar-Poli, P., Placentino, A., Carletti, F., Landi, P., Allen, P., Surguladze, S., . . . Politi, P. (2009, November). Functional atlas of emotional faces processing: a voxel-based meta-analysis of 105 functional magnetic resonance imaging studies. *Journal of Psychiatry & Neuroscience*, *34*(6), pp. 418-432.
- Gagné, M., & Deci, E. L. (2005, June). Self-determination theory and work. *Journal of Organizational Behavior*, *26*(4), pp. 331-362. doi:10.1002/job.322
- Gagné, M., & Forest, J. (2011, August). The Study of Compensation Systems Through the Lens of Self-Determination Theory: Reconciling 35 Years of Debate. *Canadian Psychology/Psychologie canadienne*. doi:10.2139/ssrn.1923827
- Garr, S., Liakopoulos, A., & Barry, L. (2014, March 05). *Performance management is broken*. Retrieved April 23, 2020, from Deloitte Insights: <https://www2.deloitte.com/us/en/insights/focus/human-capital-trends/2014/hc-trends-2014-performance-management.html>
- Gendolla, G. H. (2000, December). On the impact of mood on behavior: An integrative theory and a review. *Review of General Psychology*, *4*(4), pp. 378-408. doi:10.1037/1089-2680.4.4.378
- Gendolla, G. H., & Richter, M. (2010, September). Effort Mobilization When the Self Is Involved: Some Lessons From the Cardiovascular System. *Review of General Psychology*, *14*(3), pp. 212-226. doi:10.1037/a0019742
- Gendolla, G. H., Richter, M., & Silvia, P. J. (2008). Self-focus and task difficulty effects on effort-related. *Psychophysiology*, *45*, pp. 653-662. doi:10.1111/j.1469-8986.2008.00655.x
- Gendolla, G. H., Wright, R. A., & Richter, M. (2012). Effort Intensity: Some Insights From the Cardiovascular System. In R. M. Ryan, *The Oxford Handbook of Human Motivation* (pp. 420-434). Oxford University Press.

- Gobel, E. W., Parrish, T. B., & Reber, P. J. (2011, October 15). Neural correlates of skill acquisition: decreased cortical activity during a serial interception sequence learning task. *Neuroimage*, *58*(4), pp. 1150-1157. doi:10.1016/j.neuroimage.2011.06.090
- Gollwitzer, P., & Oettingen, G. (2015). Motivation: History of the Concept. In J. D. Wright, *International Encyclopedia of the Social & Behavioral Sciences* (pp. 936-939). New York, NY: Elsevier. doi:10.1016/B978-0-08-097086-8.03102-0
- Golman, R., & Loewenstein, G. (2018). Information Gaps: A Theory of Preferences Regarding the Presence and Absence of Information. *Decisions*, *5*(3), pp. 143-164. doi:10.1037/dec0000068
- Gould, M. (2019). *Learning Process*s. Salem Press Encyclopedia.
- Govaerts, M. J., Schuwirth, L. W., Van der Vleuten, C. P., & Muijtens, A. M. (2011, May). Workplace-based assessment: effects of rater expertise. *Advances in Health Sciences Education*, *16*(2), pp. 151-165. doi:10.1007/s10459-010-9250-7
- Grace-Martin, K. (2020). *Can Likert Scale Data ever be Continuous?* Retrieved March 06, 2020, from The Analysis Factor: <https://www.theanalysisfactor.com/can-likert-scale-data-ever-be-continuous/>
- Gracheva, A. (2018). *Freuds psychoanalytische Theorie der Motivation*. München: GRIN Verlag.
- Graham, J. R., & Naglieri, J. A. (2003). Current Issues in Self-Report Inventory Interpretation. In I. B. Weiner, *Handbook of Psychology* (pp. 567-569). Hoboken, New Jersey: John Wiley & Sons, Inc.
- Grant, A. M. (2008). Does intrinsic motivation fuel the prosocial fire? Motivational synergy in predicting persistence, performance, and productivity. *Journal of Applied Psychology*, *93*(1), pp. 48-58. doi:10.1037/0021-9010.93.1.48
- Greene, W. H. (2012). *Econometric Analysis* (Seventh ed.). Boston: Pearson Education.
- Grewal, A., Kataria, H., & Dhawan, I. (2016, September). Literature search for research planning and identification of research problem. *Indian Journal of Anaesthesia*, *60*(9), pp. 635-639. doi:10.4103/0019-5049.190618

- Grouzet, F. M., Kasser, T., Ahuvia, A., Dols, J. M., Kim, Y., Lau, S., . . . Sheldon, K. M. (2005). The Structure of Goal Contents Across 15 Cultures. *Journal of Personality and Social Psychology*, *89*(5), pp. 800-816. doi:10.1037/0022-3514.89.5.800
- Grouzet, F. M., Vallerand, R. J., Thill, E. E., & Provencher, P. J. (2004, December). From Environmental Factors to Outcomes: A Test of an Integrated Motivational Sequence. *Motivation and Emotion*, *28*, pp. 331-346. doi:10.1007/s11031-004-2387-z
- Gu, H., & Takahashi, H. (2000, April). Exponential or Polynomial Learning Curves? Case-based Studies. *Neural Computation*, *12*(4), pp. 795-809. doi:10.1162/089976600300015592
- Haggard, P. (2008). Human volition: towards a neuroscience of will. *Nature Reviews Neuroscience*(9), pp. 934-946. doi:10.1038/nrn2497
- Haggard, P. (2017, March 02). Sense of agency in the human brain. *Nature Reviews Neuroscience*, *18*, pp. 196-207. doi:10.1038/nrn.2017.14
- Hardré, P. L., & Reeve, J. (2009, July 29). Training corporate managers to adopt a more autonomy-supportive motivating style toward employees: an intervention study. *International Journal of Training and Development*, *13*(3), pp. 165-184. doi:10.1111/j.1468-2419.2009.00325.x
- Hare, T. A., Camerer, C. F., & Rangel, A. (2009, May 1). Self-control in decision-making involves modulation of the vmPFC valuation system. *Science*, *324*(5927), pp. 646-648. doi:10.1126/science.1168450
- Harlow, H. F. (1950). Learning and satiation of response in intrinsically motivated complex puzzle performance by monkeys. *Journal of Comparative and Physiological Psychology*, *43*(4), pp. 289-294. doi:10.1037/h0058114
- Harter, S. (1974, September). Pleasure Derived by Children from Cognitive Challenge and Mastery. *Child Development*, *45*(3), pp. 661-669. doi:10.2307/1127832
- Harter, S. (1977). Pleasure derived from optimal challenge and the effects of extrinsic rewards on children's difficulty level choices. *Child Development*, *49*, pp. 788-799. doi:10.1037/0022-006X.45.3.417
- Harter, S. (1978). Effectance Motivation Reconsidered. Toward a Developmental Model. *Human Development*, *21*, pp. 34-64. doi:10.1159/000271574

- Harter, S. (1981). A new self-report scale of intrinsic versus extrinsic orientation in the classroom: Motivational and informational components. *Developmental Psychology*, 17(3), pp. 300-312. doi:10.1037/0012-1649.17.3.300
- Heathfield, S. M. (2019, November 19). *The 5 Goals of Employee Performance Evaluation*. Retrieved April 23, 2020, from The Balance Careers: <https://www.thebalancecareers.com/employee-performance-evaluation-goals-1918866>
- Heider, F. (1958). *The psychology of interpersonal relations*. New York: John Wiley & Sons Inc. doi:10.1037/10628-000
- Henley, A. J., & DiGennaro Reed, F. D. (2015). Should you order the feedback sandwich? Efficacy of feedback sequence and timing. *Journal of Organizational Behavior Management*, 35(3-4), pp. 321-335. doi:10.1080/01608061.2015.1093057
- Henry, H., Zacher, H., & Desmette, D. (2017, March 28). Future Time Perspective in the Work Context: A Systematic Review of Quantitative Studies. *Frontiers in Psychology*. doi:doi.org/10.3389/fpsyg.2017.00413
- Herzberg, F., Mausner, B., & Snyderman, B. B. (1959). *The Motivation to Work* (2 ed.). New York: John Wiley.
- Hewett, R., & Conway, N. (2015, September 2). The undermining effect revisited: The salience of everyday verbal rewards and self-determined motivation. *Journal of Organizational Behavior*, 37(3). doi:10.1002/job.2051
- Hewitt, J. (2013, March 26). *Predicting repeat offenders with brain scans: You be the judge*. Retrieved March 18, 2020, from Medical Xpress: <https://medicalxpress.com/news/2013-03-brain-scans.html>
- Hill, P. C., & O'Dell, C. (2019). *Achievement motivation*. Salem Press Encyclopedia of Health.
- Hobbs, N. (1948, March). The development of a code of ethical standards for psychology. *American Psychologist*, 3(3), pp. 80-84. doi:10.1037/h0060281
- Hodgins, H. S., Yacko, H. A., & Gottlieb, E. (2006, December). Autonomy and nondefensiveness. *Motivation and Emotion*, 30(4), pp. 283-293. doi:10.1007/s11031-006-9036-7

- Hoyt, W. T. (2000, April). Rater bias in psychological research: When is it a problem and what can we do about it? *Psychological Methods*, 5(1), pp. 64-86. doi:10.1037//1082-989X.5.1.64
- Huchzermeier, A. (2019). Emerging framework: the more dynamic the environment, the higher the benefit from bottom-up emphasis. *Industrial Excellence*. Vallendar.
- Huchzermeier, A., Mercikoglu, C., & Scholz, T. R. (2019, January). Principles and Reality of Competent Employee Engagement. *SSRN Electronic Journal*. doi:10.2139/ssrn.3410271
- Huettel, S. A., Song, A. W., & McCarthy, G. (2008). *Functional Magnetic Resonance Imaging* (2 ed.). Sunderland: Sinauer Associates Inc.
- Hulac, D., Benson, N., Nesmith, M. C., & Wollersheim-Shervey, S. (2016). Using Variable Interval Reinforcement Schedules to Support Students in the Classroom: An Introduction With Illustrative Examples. *Journal of Educational Research and Practice*, 1(6), pp. 90-96. doi:10.5590/JERAP.2016.06.1.06
- Hull, C. L., Hovland, C. I., Ross, R. T., Hall, M., Perkins, D. T., & Fitch, F. B. (1940). *Mathematico-deductive theory of rote learning: a study in scientific methodology*. Yale University Press.
- Hunt, J. M. (1965). Intrinsic motivation and its role in psychological development. *Nebraska symposium on motivation*, 13, pp. 189-282. Nebraska: Nebraska University Press.
- Ilggen, D. R., & Hamstra, B. W. (1972, June). Performance satisfaction as a function of the difference between expected and reported performance at five levels of reported performance. *Organizational Behavior and Human Performance*, 7(3), pp. 359-370. doi:10.1016/0030-5073(72)90022-0
- Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology*, 52(6), pp. 1122-1131. doi:10.1037/0022-3514.52.6.1122
- Isen, M. A., Shalcker, T. E., Clark, M., & Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology*, 36(1), pp. 1-12. doi:10.1037/0022-3514.36.1.1

- Isenberg, P., Bezerianos, A., Dragicevic, P., & Fekete, J. D. (2011, December). A Study on Dual-Scale Data Charts. *IEEE Transactions on Visualizations and Computer Graphics*, *17*(12), pp. 2469-2478. doi:10.1109/TVCG.2011.160
- Iyengar, S. S., & DeVoe, S. E. (2003). Rethinking the values of choice: Considering cultural mediators of intrinsic motivation. *Nebraska symposium on motivation: Crosscultural differences in perspectives on self* (pp. 129-174). Lincoln: University of Nebraska Press.
- Jackson, S. A., & Marsh, H. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. *Journal of Sport & Exercise Psychology*, *18*(1), pp. 17-35.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*, pp. 305-360.
- Jones, E. E., & Harris, V. A. (1967, January). The attribution of attitudes. *Journal of Experimental Social Psychology*, *3*(1), pp. 1-24. doi:10.1016/0022-1031(67)90034-0
- Jost, P. J. (2008). *Organisation und Motivation: Eine ökonomisch-psychologische Einführung*. Wiesbaden: Betriebswirtschaftlicher Verlag Gabler.
- Jost, P. J. (2008). *Organisation und Motivation: Eine ökonomisch-psychologische Einführung*. Wiesbaden: Betriebswirtschaftlicher Verlag Gabler.
- Kacewicz, E., Pennebaker, J. W., Davis, M., Jeon, M., & Graesser, A. C. (2013, September 19). Pronoun Use Reflects Standings in Social Hierarchies. *Journal of Language and Social Psychology*, *33*(2), pp. 125-143. doi:10.1177/0261927X13502654
- Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.
- Kahneman, D., & Tversky, A. (1979, March). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, *47*(2), pp. 263-292. doi:10.2307/1914185
- Kasser, T., & Ryan, R. M. (1993). A dark side of the American dream: Correlates of financial success as a central life aspiration. *Journal of Personality and Social Psychology*, *65*(2), pp. 410-422. doi:10.1037/0022-3514.65.2.410
- Kasser, T., & Ryan, R. M. (1996, March 1). Further Examining the American Dream: Differential Correlates of Intrinsic and Extrinsic Goals. *Personality and Social Psychology Bulletin*, *22*(3), pp. 280-287. doi:10.1177/0146167296223006

- Kelley, H. H. (1967). Attribution Theory in Social Psychology. In D. Levine, *Nebraska Symposium on Motivation* (pp. 192-241). Lincoln: University of Nebraska Press.
- Kelley, H. H. (1973). The Processes of Causal Attribution. *American Psychologist*, pp. 107-128. doi:10.1037/h0034225
- Kent, D., Hirshleifer, D., & Siew, H. T. (2002, February). Investor psychology in capital markets: evidence and policy implications. *Journal of Monetary Economics*, 49(1), pp. 139-209. doi:10.1016/S0304-3932(01)00091-5
- Killeen, P. R., Posadas-Sanchez, D., Johansen, E. B., & Thraillkill, E. A. (2009). Progressive ratio schedules of reinforcement. *Journal of Experimental Psychology: Animal Behavior Processes*, 1(35), pp. 35-50. doi:10.1037/a0012497
- Kim, E. (2018, March 30). *Amazon employees start their day by answering a simple question about work*. Retrieved from CNBC: <https://www.cnbc.com/2018/03/30/amazon-employee-reaction-to-hr-programs-connections-forte.html>
- Kim, S. (2013, March 04). Neuroscientific model of motivational process. *Frontiers in Psychology*, 4(93). doi:10.3389/fpsyg.2013.00098
- Kim, S. (2016). Introduction to Motivational Neuroscience. In S.-i. Kim, J. M. Reeve, & M. Bong, *Recent Developments in Neuroscience Research on Human Motivation* (Vol. 19, pp. 1-19). Bingley: Emerald Group Publishing. doi:10.1108/S0749-742320160000019022
- Kim, Y., T, K., & H, L. (2003, June). Self-concept, aspirations, and well-being in South Korea and the United States. *Journal of Social Psychology*, 143(3), pp. 277-290. doi:10.1080/00224540309598445
- Klein, G. S., & Schoenfeld, N. (1941). The influence of ego-involvement on confidence. *The Journal of Abnormal and Social Psychology*, 36(2), pp. 249-258. doi:10.1037/h0061777
- Klein, S. B., Robertson, T. E., & Delton, A. W. (2010, January). Facing the future: Memory as an evolved system for planning future acts. *Memory & Cognition*, 38(1), pp. 13-22. doi:10.3758/MC.38.1.13
- Kluger, A. N., & DeNisi, A. (1996). The Effects of Feedback Interventions on Performance:: A Historical Review, a Meta-Analysis, and a Preliminary Feedback Intervention Theory. *Psychological Bulletin*, 119(2), pp. 254-284.

- Kluger, A. N., & DeNisi, A. (1996). The Effects of Feedback Interventions on Performance:: A Historical Review, a Meta-Analysis, and a Preliminary Feedback Intervention Theory. *Psychological Bulletin*, *119*(2), pp. 254-284.
- Kruglanski, A., Chernikova, M., & Kopetz, C. (2015). Motivation Science. In S. Kosslyn, *Emerging Trends in the Social and Behavioral Sciences* (pp. 1-16). Hoboken, NJ: John Wiley & Sons. doi:10.1002/9781118900772.etrds0104
- Kuhn, G. (2016, October 10). *Are You Using Unbalanced Survey Scales? Stop Now. Please*. Retrieved May 22, 2020, from Drive Research: <https://www.driveresearch.com/market-research-company-blog/are-you-using-unbalanced-survey-scales-stop-now-please/>
- Kuvaas, B., Dysvik, A., & Buch, R. (2014, February 28). Antecedents and Employee Outcomes of Line Managers' Perceptions of Enabling HR Practices. *Journal of Management Studies*, *51*(6), pp. 845-868. doi:10.1111/joms.12085
- Kyonka, E. G. (2011). Law of Effect. In S. Goldstein, & J. A. Naglieri, *Encyclopedia of Child Behavior and Development*. Boston, MA: Springer. doi:10.1007/978-0-387-79061-9_1624
- Laranjo, L. (2016). Chapter 6 - Social Media and Health Behavior Change. In S. Syed-Abdul, E. Gabarron, & A. Y. Lau, *Participatory Health Through Social Media* (pp. 83-111). Academic Press. doi:10.1016/B978-0-12-809269-9.00006-2
- Latham, G. P., Brcic, J., & Steinhauer, A. (2016, October 18). Toward an Integration of Goal Setting Theory and the Automaticity Model. *Applied Psychology*, *66*(1). doi:doi.org/10.1111/apps.12087
- Lavond, D. G., Steinmetz, J. E., Yokaitis, M. H., & Thompson, R. F. (1987, August 20). Reacquisition of classical conditioning after removal of cerebellar cortex. *Experimental Brain Research*, pp. 569-593. doi:10.1007/BF00247289
- Lee, W., Reeve, J., Xue, Y., & Xiong, J. (2012, May). Neural differences between intrinsic reasons for doing versus extrinsic reasons for doing: an fMRI study. *Neuroscience Research*, *73*(1), pp. 68-72. doi:10.1016/j.neures.2012.02.010
- Lempp, C. (2019). ZONAR – The starting point of feedback. *Bachelor thesis*.

- Leon, M. I., & Shadlen, M. N. (1999, October 24). Effect of expected reward magnitude on the response of neurons in the dorsolateral prefrontal cortex of the macaque. *Neuron*, 24(2), pp. 415-425. doi:10.1016/s0896-6273(00)80854-5
- Lewin, K. (1936). *Principles of topological psychology*. New York: McGraw-Hill.
- Lewin, K. (1938). *The conceptual representation and the measurement of psychological forces*. doi.org/10.1037/13613-000: Duke University Press.
- Lewin, K. (1947). Group Decision and Social Change. In T. Newcomb, & H. E. *Readings in Social Psychology* (pp. 197-211). New York: Holt. Retrieved from http://web.mit.edu/curhan/www/docs/Articles/15341_Readings/Organizational_Learning_and_Change/Lewin_Group_Decision_&_Social_Change_Readings_Psych_pp197-211.pdf
- Lewin, K. (1997). *Resolving Social Conflicts ; Field Theory in Social Science*. Washington: American Psychological Association.
- Libet, B., Gleason, C., Wirth, E., & Pearl, D. (1983, September). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act. *Brain*, 3, pp. 623-642. doi:10.1093/brain/106.3.623
- Lieberman, M. D., Eisenberger, N. I., Crockett, M. J., Tom, S. M., Pfeifer, J. H., & Way, B. M. (2007, May). Putting feelings into words: affect labeling disrupts amygdala activity in response to affective stimuli. *Psychological Science*, 18(5), pp. 421-428. doi:10.1111/j.1467-9280.2007.01916.x
- Liker, J. K., & Hoseus, M. (2008). *Toyota Culture: The Heart and Soul of the Toyota Way*. January: McGraw Hill.
- Litman, J. A. (2005). Curiosity and the pleasures of learning: Wanting and liking new information. *Cognition and Emotion*, 19(6), pp. 793-814. doi:10.1080/02699930541000101
- Lloyd, R. (2013, September 28). *Review: 'Masters of Sex' explores the science of sex*. Retrieved February 24, 2020, from Los Angeles Times: <https://www.latimes.com/entertainment/tv/la-xpm-2013-sep-28-la-et-st-masters-of-sex-review-story.html>

- Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs: Prentice-Hall.
- Locke, E. A., & Schattke, K. (2019). Intrinsic and extrinsic motivation: Time for expansion and clarification. *Motivation Science*, 5(4), pp. 277-290. doi:10.1037/mot0000116
- Locke, E., & Latham, G. P. (2019). The development of goal setting theory: A half century retrospective. *Motivation Science*, 5(2), pp. 93-105. doi:10.1037/mot0000127
- Loewenstein, G. (1994, July). The Psychology of Curiosity: A Review and Reinterpretation. *Psychological Bulletin*, 116(1), pp. 75-98. doi:10.1037/0033-2909.116.1.75
- Logan, F. (1999). Principles: External inhibition & disinhibition. In *Basic Principles of Learning*. Retrieved February 23, 2020, from <http://www.unm.edu/~quadd/>
- London, M., & Beatty, R. W. (1993, Summer/Fall). 360-Degree-Feedback as a Competitive Advantage. *Human Resource Management*, 32(2-3), pp. 353-372. doi:10.1002/hrm.3930320211
- Lubke, G. H., & Muthén, B. O. (2004). Applying Multigroup Confirmatory Factor Models for Continuous Outcomes to Likert Scale Data Complicates Meaningful Group Comparisons. *Structural Equation Modeling*, 11(4), pp. 514-534. doi:10.1207/s15328007sem1104_2
- Lück, H. E. (2001). *Kurt Lewin: Eine Einführung in sein Werk*. Beltz.
- MacKay, D. M. (1965). Cerebral Organization and the Conscious Control of Action. In J. C. Eccles, *Brain and Conscious Experience* (pp. 422-445). Berlin: Springer Verlag. doi:10.1007/978-3-642-49168-9_17
- Maehr, M. L., & Sjogren, D. D. (1971, April). Atkinson's Theory of Achievement Motivation: First Step toward a Theory of Academic Motivation? *Review of Educational Research*, 41(2), pp. 143-161. doi:10.2307/1169490
- Malcom, P. (1991). Reflections on Field Theory. *The British Gestalt Journal*, pp. 68-91.
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(IV), 370-396.
- Maslow, A. H. (1970). *Motivation and Personality*. New York: Harper and Row.
- Maslow, A. H. (1996). *Future visions: The unpublished papers of Abraham Maslow*. (E. Hoffman, Ed.) Sage Publications, Inc.

- Masuda, A., Locke, E. A., & Williams, K. J. (2015, January). The effects of simultaneous learning and performance goals on performance: An inductive exploration. *Journal of Cognitive Psychology, 27*(1), pp. 37-52. doi:10.1080/20445911.2014.982128
- Matarazzo, J. D. (1987). William A. Hunt (1903-1986). *American Psychologist, 42*(3), pp. 263-264. doi:10.1037/h0092033
- Matsumoto, K., Suzuki, W., & Tanaka, K. (2003, July 11). Neuronal correlates of goal-based motor selection in the prefrontal cortex. *Science, 301*(5630), pp. 229-232. doi:10.1126/science.1084204
- Mazur, J. E. (2013). *Basic Principles of Operant Conditioning* (7 ed.). Upper Saddle River: Pearson.
- McAuley, E., Duncan, T., & Tammen, V. V. (1989, March). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: a confirmatory factor analysis. *Research quarterly for exercise and sports, 60*(1), pp. 48-58. doi:10.1080/02701367.1989.10607413
- McBride, T., E, A. S., & Gur, R. C. (1999, September). A comparative volumetric analysis of the prefrontal cortex in human and baboon MRI. *Brain, Behavior and Evolution, 54*(3), pp. 159-166. doi:10.1159/000006620
- McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1953). *Century psychology series. The achievement motive*. Appleton-Century-Crofts. doi:10.1037/11144-000
- McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1953). *The achievement motive*. East Norwalk: Appleton-Century-Crofts. doi:doi.org/10.1037/11144-000
- McHoskey, J. W. (1999, December). Machiavellianism, Intrinsic Versus Extrinsic Goals, and Social Interest: A Self-Determination Theory Analysis. *Motivation and Emotion, 23*, pp. 267-283. doi:10.1023/A:1021338809469
- McLeod, S. A. (2018, August 21). *Classical conditioning*. Retrieved February 23, 2020, from Simply psychology: <https://www.simplypsychology.org/classical-conditioning.html>
- McLeod, S. A. (2018, August 21). *Simply psychology*. Retrieved February 24, 2020, from Classical conditioning: <https://www.simplypsychology.org/classical-conditioning.html>
- Mercer. (2016). *Global Job Evaluation Return on Investment Survey: Results Report*. Mercer Talent Information Solutions' Data Mining & Insights.

- Merchant, K., & van der Stede, W. (2017). *Management Control Systems 4th Edition: Performance Measurement, Evaluation and Incentives*. Pearson Education Limited.
- Messer, D. J. (1993). *Mastery motivation in early childhood: Development, measurement and social processes*. Routledge. doi:10.4324/9780203415610
- Miller, G. A. (1956). The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information. *Psychological Review*, 101(2), pp. 343-352. doi:10.1037/0033-295X.63.4.81
- Miller, G. A., Galanter, E., & Pribram, K. H. (1960, October). Plans and the structure of behavior (book review). *Journal of Comparative Neurology*, 115(2), p. 226. doi:10.1002/cne.901150208
- Miller, K. D. (2019, April 11). *The Psychology and Theory Behind Flow*. Retrieved March 04, 2020, from Positive Psychology: <https://positivepsychology.com/theory-psychology-flow/>
- Miller, N. E., & Dollard, J. (1941). *Social Learning and Imitation*. New Haven: Yale University Press.
- Miltenberger, R. G. (2008). *Behavioral Modification: Principles and Procedures*. Thomson/Wadsworth.
- Miró, A. (1999). *Motivation: Eine psychoanalytische Interpretation*. Retrieved February 10, 2020, from Dr. Alexander Miró: http://www.alexander-miro.de/publikationen/motivation_eine_psychoanalytische_interpretation/
- Mischel, W., Jeffery, K. M., & Patterson, C. J. (1974, October). The layman's use of trait and behavioral information to predict behavior. *Journal of Research in Personality*, 8(1), pp. 231-242. doi:10.1016/0092-6566(74)90034-8
- Morgan, C. T. (1957). Physiological mechanisms of motivation. In M. R. Jones, *Nebraska symposium of motivation* (pp. 1-35). Nebraska: Nebraska University Press.
- Mouratidis, T., Lens, W., & Vansteenkiste, M. (2010, October). How You Provide Corrective Feedback Makes a Difference: The Motivating Role of Communicating in an Autonomy-Supporting Way. *Journal of Sport & Exercise Psychology*, 32(5), pp. 619-637. doi:10.1123/jsep.32.5.619

- Mouratidis, T., Vansteenkiste, M., Lens, W., & Sideridis, G. (2008, April). The Motivating Role of Positive Feedback in Sport and Physical Education: Evidence for a Motivational Model. *Journal of Sport & Exercise Psychology*, 30(2), pp. 240-268. doi:10.1123/jsep.30.2.240
- Mouratidis, T., Vansteenkiste, M., Sideridis, G., & Lens, W. (2011, May). Vitality and Interest-Enjoyment as a Function of Class-to-Class Variation in Need-Supportive Teaching and Pupils' Autonomous Motivation. *Journal of Educational Psychology*, 103(2), pp. 353-366. doi:10.1037/a0022773
- Murayama, K., Kitagami, S., Tanaka, A., & Raw, J. (2016). People's naiveté about how extrinsic rewards influence intrinsic motivation. *Motivation Science*, 2(3), pp. 138-142. doi:10.1037/mot0000040
- Murayama, K., Matsumoto, M., Izuma, K., & Matsumoto, K. (2010, December 07). Neural basis of the undermining effect of monetary reward on intrinsic motivation. *Proceedings of the National Academy of Sciences of the United States of America*, 107(49), pp. 20911-20916. doi:10.1073/pnas.1013305107
- Murayama, K., Matsumoto, M., Izuma, K., Sugiura, A., Ryan, R. M., Deci, E. L., & Matsumoto, K. (2015, May). How self-determined choice facilitates performance: a key role of the ventromedial prefrontal cortex. *Cerebral Cortex*, 25(5), pp. 1241-1251. doi:10.1093/cercor/bht317
- Murphy, K. P., & Alexander, P. A. (2000, January). A Motivated Exploration of Motivation Terminology. *Contemporary Educational Psychology*, 25(1), pp. 3-53. doi:10.1006/ceps.1999.1019
- Murray, H. A. (1938). *Explorations in personality*. Oxford: Oxford University Press.
- Nadler, R. (2011, May 30). *What Was I Thinking? Handling the Hijack*. Retrieved from Psychology Today: <https://www.psychologytoday.com/intl/blog/leading-emotional-intelligence/201105/where-did-my-iq-go-no-2-handling-the-hijack>
- Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Snyder, & S. J. Lopez, *Handbook of positive psychology* (pp. 89-105). Oxford University Press. doi:10.1007/978-94-017-9088-8_16

- Narvaez, D. F. (2011, December 11). *Dangers of "Crying It Out"*. Retrieved February 24, 2020, from Psychology Today: <https://www.psychologytoday.com/us/blog/moral-landscapes/201112/dangers-crying-it-out>
- Neale, M. A., & Bazerman, M. H. (1985, March). The Effects of Framing and Negotiator Overconfidence on Bargaining Behaviors and Outcomes. *The Academy of Management Journal*, 28(1), pp. 34-49. doi:10.2307/256060
- Ng, K., Koh, C., Ang, S., Kennedy, J. C., & Chan, K. Y. (2011, September). Rating leniency and halo in multisource feedback ratings: testing cultural assumptions of power distance and individualism-collectivism. *Journal of Applied Psychology*, 95(6), pp. 1033-1044. doi:10.1037/a0023368
- Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009, June). The path taken: Consequences of attaining intrinsic and extrinsic aspirations in post-college life. *Journal of Research in Personality*, 43(3), pp. 291-306. doi:10.1016/j.jrp.2008.09.001
- Nissen, H. W. (1930). A study of exploratory behavior in the white rat by means of the obstruction method. *The Pedagogical Seminary and Journal of Genetic Psychology*, 37, pp. 361-376. doi:10.1080/08856559.1930.9944162
- Nix, G., Ryan, R. M., Manly, J. B., & Deci, E. L. (1999, May). Revitalization through self-regulation: The effects of autonomous and controlled motivation on happiness and vitality. *Journal of Experimental Social Psychology*, 35(3), pp. 266-284. doi:10.1006/jesp.1999.1382
- Northouse, P. G. (2016). *Leadership: Theory and Practice* (7th ed.). Western Michigan University: SAGE Publications Inc.
- O'Doherty, J., Dayan, P., Schultz, J., Deichmann, R., Friston, K., & Dolan, R. J. (2004, April 16). Dissociable roles of ventral and dorsal striatum in instrumental conditioning. *Science*, 304(5669), pp. 452-454. doi:10.1126/science.1094285
- Ormord, J. E. (1990). *Human Learning: Theories, principles, and educational applications*. Columbus: Merrill.
- Parcells, B. (2000, November). The Tough Work of Turning Around a Team. *Harvard Business Review*, pp. 5-8.

- Pardo, J. V., Pardo, P. J., Janer, K. W., & E, R. M. (1990, January). The anterior cingulate cortex mediates processing selection in the Stroop attentional conflict paradigm. *Proceedings of The National Academy of Sciences*, 87(1), pp. 256-259. doi:10.1073/pnas.87.1.256
- Parkes, J., Abercrombie, S., & McCarty, T. (2012, May 12). Feedback sandwiches affect perceptions but not performance. *Advances in Health Sciences Education*, 18, pp. 297-407. doi:10.1007/s10459-012-9377-9
- Pavlov, I. P. (1910). *The work of the digestive glands*. (S. H. Thompson, Trans.) London: Charles Griffin & Company Limited. Retrieved February 23, 2020, from <https://archive.org/details/workofdigestiveg00pavlrch/page/n8/mode/2up>
- Pennebaker, J. W., Boyd, R. L., Jordan, K., & Blackburn, K. (2015). *The Development and Psychometric Properties of LIWC2015*. Austin, TX: University of Texas in Austin.
- Peterson, G. B. (2004, November). A day of great illumination: B. F. Skinner's discovery of shaping. *Journal of the Experimental Analysis of Behavior*, 3(82), pp. 317-328. doi:10.1901/jeab.2004.82-317
- Pintrich, P. R. (1994). Continuities and discontinuities: Future directions for research in educational psychology. *Educational Psychologist*, 49(3), pp. 137-148. doi:10.1207/s15326985ep2903_3
- Piret, R. E. (2019, Autumn semester). How neuroscience can inform us on management & leadership. ESCP Paris.
- Poldrack, R. A. (2011, December 08). Inferring mental states from neuroimaging data: From reverse inference to large-scale decoding. *Neuron*, 72(5), pp. 692-697. doi:10.1016/j.neuron.2011.11.001
- Pollak, M. H., & Hart, J. R. (2017). Physical Activity Increases after an Affectively Arousing Daily Life Event. *Frontiers in Psychology*, 8(518). doi:10.3389/fpsyg.2017.00518
- Poldrack, R. A. (2006, February 1). Can cognitive processes be inferred from neuroimaging data? *Trends in Cognitive Sciences*, 10(2), pp. 59-63. doi:10.1016/j.tics.2005.12.004
- Porath, C., Spreitzer, G., Gibson, C., & Gernett, F. G. (2012, May 19). Thriving at work: Toward its measurement, construct validation, and theoretical refinement. *Journal of Organizational Behavior*, 33(2), pp. 250-275. doi:10.1002/job.756

- Porter, M. E. (1979, March-April). How Competitive Forces Shape Strategy. *Harvard Business Review*, 57(2), pp. 137-145.
- Powers, W. T. (1973). *Behavior: The control of perception*. Aldine.
- Powers, W. T. (1974, November). Behavior: The control of perception (book review). *Behavioral Science*, 19(6), p. 269. doi:10.1002/bs.3830190609
- Pratkanis, A. R., & Turner, M. E. (2019). Kurt Lewin's field theory. In *Salem Press Encyclopedia of Health*. Salem Press.
- Ramaprasad, A. (1983, January). On the definition of feedback. *Behavioral Science*, 28(1), pp. 4-13. doi:10.1002/bs.3830280103
- Ramsay, D. J., & Booth, D. (1991). *Thirst. Physiological and Psychological Aspects*. London: Springer Verlag. doi:10.1007/978-1-4471-1817-6
- Reeve, J., & Lee, W. (2012). Neuroscience and Human Motivation. In R. M. Ryan, *The Oxford Handbook of Human Motivation*. Oxford University Press. doi:10.1093/oxfordhb/9780195399820.001.0001
- Reid, S. C., Salmon, K., & Lovibond, P. F. (2006). Cognitive Biases in Childhood Anxiety, Depression, and Aggression: Are they Pervasive or Specific? *Cognitive Therapy and Research*, 30(5), pp. 531-549. doi:10.1007/s10608-006-9077-y
- Rescorla, R. A. (1967). Pavlovian Conditioning and Its Proper Control Procedures. *Psychological Review*, 1(74), pp. 71-80. Retrieved from https://uk.sagepub.com/sites/default/files/upm-binaries/23600_Ch_1.pdf
- Rescorla, R. A. (1988). Pavlovian Conditioning: It's Not What You Think It Is. *American Psychologist*, 4(43), pp. 151-160. Retrieved from [https://web.stanford.edu/class/psych227/RESCORLA%20\(1988\).pdf](https://web.stanford.edu/class/psych227/RESCORLA%20(1988).pdf)
- Rescorla, R. A., & Wagner, A. R. (1972). A theory of Pavlovian conditioning: Variations on the. In A. H. Black, & W. F. Prokasy, *Classical conditioning II: Current research and theory* (pp. 64-99). New York: Appleton-Century-Crofts.
- Richter, M., & Gendolla, G. H. (2009, May). The heart contracts to reward: monetary incentives and prejection period. *Psychophysiology*, 46(3), pp. 451-457. doi:10.1111/j.1469-8986.2009.00795.x

- Rigby, S. C., & Ryan, R. M. (2018, April 20). Self-Determination Theory in Human Resource Development: New Directions and Practical Considerations. *Advances in Developing Human Resources*, 20(2), pp. 133-147. doi:10.1177/1523422318756954
- Rohde, M., & Ernst, M. O. (2016, April). Time, agency, and sensory feedback delays during action. *Current Opinion in Behavioral Sciences*(8), pp. 193-199. doi:10.1016/j.cobeha.2016.02.029
- Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. In L. Berkowitz, *Advances in experimental social psychology* (10 ed., pp. 173-220). New York: Academic Press.
- Rotter, J. B. (1975). Some problems and misconceptions related to the construct of internal versus external control of reinforcement. *Journal of Consulting and Clinical Psychology*, 43(1), pp. 56-67. doi:10.1037/h0076301
- Rotter, J. B. (1980). *Social learning and clinical psychology*. New York: Johnson Reprint Corp.
- Rudolph, U. (2007). *Motivationspsychology*. Weinheim: Beltz PVU.
- Ryan, R. M. (1982, September). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology*, 43(3), pp. 450-461. doi:10.1037/0022-3514.43.3.450
- Ryan, R. M. (1995, September). Psychological Needs and the Facilitation of Integrative Processes. *Journal of Personality*, 63(3), pp. 397-427. doi:10.1111/j.1467-6494.1995.tb00501.x
- Ryan, R. M., & Deci, E. L. (2008, March). From Ego Depletion to Vitality: Theory and Findings Concerning the Facilitation of Energy Available to the Self. *Social and Personality Psychology Compass*, 2(2), pp. 702-707. doi:10.1111/j.1751-9004.2008.00098.x
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York: Guilford Press.
- Ryan, R. M., & Deci, E. L. (2017). *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*. New York: Guilford Press.
- Ryan, R. M., & Deci, E. L. (2019). Brick by Brick: The Origins, Development, and Future of Self-Determination Theory. In A. J. Elliot, *Advances in Motivation Science* (Vol. 6, pp. 111-156). Elsevier. doi:10.1016/bs.adms.2019.01.001

- Ryan, R. M., & Deci, E. L. (2019). Brick by Brick: The Origins, Development, and Future of Self-Determination Theory. In A. J. Elliot, *Advances in Motivation Science* (Vol. 6, pp. 111-156). Elsevier. doi:10.1016/bs.adms.2019.01.001
- Ryan, R. M., & Deci, E. L. (2019). Research on intrinsic and extrinsic motivation is alive, well, and reshaping 21st-century management approaches: Brief reply to Locke and Schattke (2019). *Motivation Science*, 5(4), pp. 291-294. doi:10.1037/mot0000128
- Ryan, R. M., & Di Domencio, S. I. (2016). Distinct Motivations and Their Differentiated Mechanisms: Reflections on the Emerging Neuroscience of Human Motivation. In S.-i. Kim, J. Reeve, & M. Bong, *Recent Developments in Neuroscience Research on Human Motivation* (p. January). Emerald Group Publishing Limited. doi:10.1108/S0749-742320160000019009
- Ryan, R. M., Berstein, J., & Brown, K. W. (2010, January). Weekends, Work, and Well-Being: Psychological Need Satisfactions and Day of the Week Effects on Mood, Vitality, and Physical Symptoms. *Journal of Social and Clinical Psychology*, 29(1), pp. 95-122. doi:10.1521/jscp.2010.29.1.95
- Ryan, R. M., Chirkov, V., Little, T., & Deci, E. (1999, December). The American Dream in Russia: Extrinsic Aspirations and Well-Being in Two Cultures. *Personality and Social Psychology Bulletin*, 25(12), pp. 1509-1524. doi:10.1177/01461672992510007
- Ryan, R. M., Connel, J. P., & Deci, E. L. (1985). A motivational analysis of self-determination and self-regulation in education. In C. Ames, & R. E. Ames, *Research on motivation in education: The classroom milieu* (pp. 13-51). New York: Academic Press.
- Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. *Journal of Personality and Social Psychology*, 45(4), pp. 736-750. doi:10.1037/0022-3514.45.4.736
- Sabir, M. (2014, December). Effectance Motivation: A Practical Outcome. *The International Journal of Reminiscence and Life Review*, 2(1), pp. 16-33. doi:10.1.1.886.3821
- Salamone, J. (2012, November 30). UConn Researcher: Dopamine Not About Pleasure (Anymore). (C. Buckley, Interviewer) Retrieved April 09, 2020, from <https://today.uconn.edu/2012/11/uconn-researcher-dopamine-not-about-pleasure-anymore/#>

- Salamone, J., & Mercè, C. (2012, November 08). The Mysterious Motivational Functions of Mesolimbic Dopamine. *Neuron*, 76(3), pp. 470-485. doi:10.1016/j.neuron.2012.10.021
- Saper, C., Chou, T., & Elmquist, J. (2002, October 10). The need to feed: homeostatic and hedonic control of eating. *Neuron*, 36(2), pp. 199-211. doi:10.1016/s0896-6273(02)00969-8
- Schmale, H. (1995). *Psychologie der Arbeit*. Stuttgart.
- Schmidt, B., Loerborcks, A., Herr, R. M., Wilson, M. G., Jarczok, M. N., Litaker, D., . . . Fischer, J. E. (2014). Associations between supportive leadership and employees self-rated health in an occupational sample. *International Journal of Behavioral Medicine*, 21(5), pp. 750-756. doi:10.1007/s12529-013-9345-7
- Schmidt, F. L. (2013). The economic value of goal setting to employers. In E. A. Locke, & G. P. Latham, *New developments in goal setting and task performance* (pp. 16-20). New York: Routledge Taylor & Francis Group.
- Schmidt, J., & Feltes, T. (2012). *Gewalt gegen Rettungskräfte: Bestandsaufnahme zur Gewalt gegen Rettungskräfte in Nordrhein-Westfalen*. Lehrstuhl für Kriminologie, Kriminalpolitik und Polizeiwissenschaft. Bochum: Ruhr-Universität Bochum. Retrieved from https://www.unfallkasse-nrw.de/fileadmin/server/download/PDF_2012/Gewalt_gegen_Rettungskraefte.pdf
- Schneider, J., & Locke, E. A. (1971, July). A critique of Herzberg's incident classification system and a suggested revision. *Organizational Behavior and Human Performance*, 6(4), pp. 441-457. doi:10.1016/0030-5073(71)90027-4
- Scholar, A. A., Miele, D. B., Murayama, K., & Fujita, K. (2018). New directions in self-regulation: the role of metamotivational beliefs. *Current Directions in Psychological Science*, 27(6), pp. 437-442. doi:10.1177/0963721418790549
- Schultheiss, O. C. (2008). Implicit motives. In O. P. John, R. W. Robins, & L. A. Pervin, *Handbook of personality: Theory and research* (pp. 603-633). New York: Guilford.
- Schultz, W. (1986, November). Responses of midbrain dopamine neurons to behavioral trigger stimuli in the monkey. *Journal of Neurophysiology*, 56(5), pp. 1439-1461. doi:10.1152/jn.1986.56.5.1439

- Schultz, W. (2015, July). Neuronal Reward and Decision Signals: From Theories to Data. *Physiological Reviews*, 95(3), pp. 853-951. doi:10.1152/physrev.00023.2014
- Schultz, W. (2016, March). Dopamine reward prediction error coding. *Dialogues in clinical neuroscience*, 18(1), pp. 23-32. Retrieved from https://www.researchgate.net/publication/302578615_Dopamine_reward_prediction_error_coding
- Schultz, W., Dayan, P., & Montague, P. R. (1997, March 14). A neural substrate of prediction and reward. *Science*, 275(5306), pp. 1593-1599. doi:10.1126/science.275.5306.1593
- Scullen, S. E., Mount, M. K., & Goff, M. (2000, December). Understanding the Latent Structure of Job Performance Ratings. *Journal of Applied Psychology*, 85(6), pp. 956-970. doi:10.1037/0021-9010.85.6.956
- Segers, E., Beckers, T., Geurts, H., Claes, L., Danckaerts, M., & van der Oord, S. (2018, March 28). Working Memory and Reinforcement Schedule Jointly Determine Reinforcement Learning in Children: Potential Implications for Behavioral Parent Training. *Front. Psychol.*, 9(394). doi:10.3389/fpsyg.2018.00394
- Sevinc, G., Gurvit, H., & Spreng, N. R. (2017, March 09). Salience network engagement with the detection of morally laden information. *Social Cognitive and Affective Neuroscience*, 12(7), pp. 1118-1127. doi:10.1093/scan/nsx035
- Seward, J. P. (1956). Drive, incentive, and reinforcement. *Psychological Review*, 63(3), pp. 195-203. doi:<https://doi.org/10.1037/h0048229>
- Seymour, B., & McClure, S. M. (2008, April). Anchors, scales and the relative coding of value in the brain. *Current opinion in neurobiology*, 18(2), pp. 173-178. doi:10.1016/j.conb.2008.07.010
- Shamir, B., House, R., & Arthur, M. (1993, November). The Motivational Effects of Charismatic Leadership: A Self-Concept Based Theory. *Organization Science*, 4(4), pp. 577-594. doi:10.1287/orsc.4.4.577
- Sheldon, K. M., & Krieger, L. S. (2014, February 20). Service job lawyers are happier than money job lawyers, despite their lower income. *Journal of Positive Psychology*, 9(3), pp. 219-226. doi:10.1080/17439760.2014.888583

- Sheldon, K. M., & Prentice, M. (2017, November 16). Self-determination theory as a foundation for personality researchers. *Journal of Personality, 87*(1), pp. 5-14. doi:10.1111/jopy.12360
- Sheldon, K. M., Turban, D. B., Brown, K. G., Barrick, M. R., & Judge, T. A. (2003, January). Applying Self-Determination Theory to Organizational Research. *Research in Personnel and Human Resources Management, 22*, pp. 357-393. doi:10.1016/S0742-7301(03)22008-9
- Sherrod, D. R., Hage, J. N., Halpern, P. L., & Moore, B. S. (1977, January). Effects of Personal Causation and Perceived Control on Responses to an Aversive Environment: The More Control, The Better. *Journal of Experimental Social Psychology, 13*(1), pp. 14-27. doi:10.1016/0022-1031(77)90010-5
- Simpson, E. H., & Balsam, P. D. (2015). The Behavioral Neuroscience of Motivation: An Overview of Concepts, Measures, and Translational Applications. In E. H. Simpsons, & P. D. Balsam, *Behavioral Neuroscience of Motivation. Current Topics in Behavioral Neurosciences* (pp. 1-12). Springer, Cham. doi:10.1007/7854_2015_402
- Sitzman, D. M., Rhodes, M. G., & Kornell, N. (2016). The influence of feedback on predictions of future memory performance. *Memory & Cognition, 44*, pp. 1102-1113. doi:10.3758/s13421-016-0623-x
- Skinner, B. F. (1938). *The Behavior of Organisms: An Experimental Analysis*. New York: Appleton-Century-Crofts, Inc.
- Skinner, B. F. (1948). *Verbal Behavior*. Harvard University: Harvard University Press. Retrieved from <http://www.behavior.org/resources/595.pdf>
- Slemp, G. R., Kern, M. L., Patrick, K. J., & Ryan, R. M. (2018). Leader autonomy support in the workplace: A meta-analytic review. *Motivaton and Emotion, 42*, pp. 706-724. doi:10.1007/s11031-018-9698-y
- Smith, W. E. (1975). *The effects of anticipated vs. unanticipated social reward on subsequent intrinsic motivation*. Cornell University, Ithaka.
- Snedecor, G. W., & Cochran, W. G. (1989). *Statistical Methods* (Vol. 6th). Ames, Iowa: Iowa State University Press.

- Soenens, B., Berzonsky, M. D., Vansteenkiste, M., Beyers, W., & Goossens, L. (2005, August 17). Identity styles and causality orientations: In search of the motivational underpinnings of the identity exploration process. *European Journal of Personality*, *19*(5), pp. 427-442. doi:10.1002/per.551
- Sparzo, F. J. (2019). Pavlovian conditioning. In F. J. Sparzo, *Salem Press Encyclopedia of Health* (p. 5). Salem Press.
- Spreitzer, G. M., & Christine, P. (2014). Self-Determination as a Nutriment for Thriving: Building an Integrative Model of Human Growth at Work. In M. Gagné, *The Oxford Handbook of Work Engagement, Motivation, and Self-Determination Theory* (pp. 245-258). Oxford: Oxford University Press.
- Statista. (2012, August). *Anteil ausgewählter Wirtschaftssektoren an der Nettowertschöpfung in Deutschland in den Jahren 1850 bis 1989*. Retrieved April 28, 2020, from Statista: <https://de.statista.com/statistik/daten/studie/250092/umfrage/anteil-der-wirtschaftssektoren-an-der-nettowertschoepfung-in-deutschland/>
- Statista. (2016, November 21). *Wird Ihre eigene Leistung regelmäßig in einem festgelegten Verfahren durch einen Vorgesetzten bewertet?* Retrieved April 22, 2020, from Statista: <https://de.statista.com/login.bibproxy.whu.edu/statistik/daten/studie/179875/umfrage/bewertung-der-eigenen-arbeitsleistung-durch-vorgesetzten/>
- Stauffer, W. R., Lak, A., & Schultz, W. (2014, November 3). Dopamine reward prediction error responses reflect marginal utility. *Current Biology*, *24*(21), pp. 2491-2500. doi:10.1016/j.cub.2014.08.064
- Stillman, T. F., Baumeister, R. F., Lambert, N. M., Crescioni, A. W., DeWall, C. N., & Fincham, F. D. (2010, July 01). Alone and Without Purpose: Life Loses Meaning Following Social Exclusion. *Journal of Experimental Social Psychology*, *45*(4), pp. 686-694. doi:10.1016/j.jesp.2009.03.007
- Sting, F. J., & Loch, C. H. (2015, December 22). Implementing Operations Strategy: How Vertical and Horizontal Coordination Interact. *Production and Operations Management*, *25*(7). doi:10.1111/poms.12537
- Strombach, T., Hubert, M., & Kenning, P. (2015, October). The neural underpinnings of performance-based incentives. *Journal of Economic Psychology*, *50*, pp. 1-12. doi:10.1016/j.joep.2015.06.004

- Strombach, T., Weber, B., Hangebrauk, Z., Kenning, P., Karipidis, I. I., Tobler, P. N., & Kalenscher, T. (2015, February 3). Social discounting involves modulation of neural value signals by temporoparietal junction. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(5), pp. 1619-1624. doi:10.1073/pnas.1414715112
- Sullivan, G., & Artino, A. R. (2013). Analyzing and Interpreting Data From Likert-Type Scales. *Journal of Graduate Medical Education*., pp. 541-542. doi:10.4300/JGME-5-4-18
- Suvorov, A., & van de Ven, J. (2006, March 21). Discretionary Bonuses as a Feedback Mechanism. *Amsterdam Law School Legal Studies Research Paper Series*.
- Taormina, R. J., & Gao, J. H. (2013, May). Maslow and the Motivation Hierarchy: Measuring Satisfaction of the Needs. *The American Journal of Psychology*, *126*(2), pp. 155-177. doi:10.5406/amerjpsyc.126.2.0155
- Tarbox, J., & Tarbox, C. (2017). *Training Manual for Behavior Technicians Working with Individuals with Autism*. (J. Tarbox, & C. Tarbox, Eds.) Academic Press. doi:10.1016/B978-0-12-809408-2.00001-5
- Tay, L., & Diener, E. (2011). Needs and subjective well-being around the world. *Journal of Personality and Social Psychology*, *101*(2), pp. 354-365. doi:10.1037/a0023779
- Taylor, F. W. (1911). *The Principles of Scientific Management*. New York and London: Haper & Brothers.
- ten Cate, O. T. (2013, October). Why receiving feedback collides with self determination. *Advances in Health Science Education: Theory and Practice*, *18*(4), pp. 845-849. doi:10.1007/s10459-012-9401-0
- Tennant, C., & Roberts, C. A. (2000, April-June 08). Hoshin Kanri: a technique for strategic quality management. *Quality assurance*, *8*(2), pp. 77-90. doi:10.1080/105294100317173862
- Thayer, R. E. (1987). Energy, tiredness, and tension effects of a sugar snack versus moderate exercise. *Journal of Personality and Social Psychology*, *1*, pp. 119-125. doi:10.1037/0022-3514.52.1.119
- Thayer, R. E. (1997). *The Origin of Everyday Moods*. New York: Oxford University Press.

- Thayer, R. E. (2012). Moods of Energy and Tension That Motivate. In R. M. Ryan, *The Oxford Handbook of Human Motivation*. Oxford University Press. doi:10.1093/oxfordhb/9780195399820.013.0023
- The Science of Psychotherapy. (2017, January 04). *Prefrontal Cortex*. Retrieved March 18, 2020, from The Science of Psychotherapy: <https://www.thescienceofpsychotherapy.com/prefrontal-cortex/>
- Thompson, S. (2019). *Attribution Theory*. Retrieved February 29, 2020, from Salem Press Encyclopedia: <https://search.ebscohost.com/login.bibproxy.whu.edu/login.aspx?direct=true&db=ers&AN=89164082&site=eds-live>
- Thorndike, E. L. (1898). Animal intelligence: An experimental study of the associative processes in animals. *The Psychological Review: Monograph Supplements*, 4(2), pp. i-109. doi:10.1037/h0092987
- Thorndike, E. L. (1920). A constant error in psychological ratings. *Journal of Applied Psychology*, 4(1), pp. 25-29. doi:10.1037/h0071663
- Thorndike, E. L. (1927, December). The law of effect. *The American Journal of Psychology*, 39(1/4), pp. 212-222. doi:10.2307/1415413
- Tolman, E. C. (1932). *Purposive behavior in animals and men*. New York: Appleton-Century-Crofts.
- Torre, J. B., & Lieberman, M. D. (2018). Putting Feelings Into Words: Affect Labeling as Implicit Emotion Regulation. *Emotion Review*, 10(2), pp. 116-124. doi:10.1177/1754073917742706
- Tosi, H. L., Werner, S., Katz, J. P., & Gomez-Mejia, L. R. (2000, April). How Much Does Performance Matter? A Meta-analysis of CEO Pay Studies. *Journal of Management*, 26(2), pp. 301-339. doi:10.1177/014920630002600207
- Tversky, A., & Kahneman, D. (1981, January 30). The framing of decisions and the psychology of choice. *Science*(211), pp. 453-458. doi:10.1126/science.7455683
- Uvnäs-Moberg, K., & Petersson, M. (2005, Juli). Oxytocin, ein Vermittler von Antistress, Wohlbefinden, sozialer Interaktion, Wachstum und Heilung. *Zeitschrift für*

psychosomatische Medizin und Psychotherapie, 51, pp. 57-80.
doi:10.13109/zptm.2005.51.1.57

van den Broeck, A., Ferris, L. D., Chang, C.-H., & Rosen, C. C. (2016, July). A Review of Self-Determination Theory's Basic Psychological Needs at Work. *Journal of Management*, 42(5), pp. 1195-1229. doi:10.1177/0149206316632058

Van Haute, P. (2017, November 7). *Translating Trieb in the First Edition of Freud's Three Essays on the Theory of*. Retrieved February 10, 2020, from Society of Psychoanalysis and Psychoanalytic Psychology (Division 39): <http://www.div39members.wildapricot.org/resources/Documents/DR%20Articles/Translating%20Trieb.pdf>

Vansteenkiste, M., Neyrinck, B., Niemic, C., Soenens, B., de Witte, H., & van den Broeck, A. (2007). On the relations among work value orientations, psychological need satisfaction and job outcomes: A self-determination theory approach. *Journal of Occupational and Organizational Psychology*, 80, pp. 251-277. doi:10.1348/096317906X111024

Vansteenkiste, M., Niemic, C. P., & Soenens, B. (2010, July). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. *Advances in Motivation and Achievement*, 16A, pp. 105-165. doi:10.1108/S0749-7423(2010)000016A007

Vaughn, L. A. (2019). Distinguishing Between Need Support and Regulatory Focus with LIWC. *Collabra: Psychology*, 5(1), p. 32. doi:10.1525/collabra.185/

Vaughn, L. A. (2018, May 16). Contents of Hopes and Duties: A Linguistic Analysis. *Frontier in Psychology*. doi:10.3389/fpsyg.2018.00757

von Bergen, C. W., Bressler, M. S., & Campbell, K. (2014, September). The Sandwich Feedback Method: not very tasty. *Journal of Behavioral Studies in Business*, 7. Retrieved from https://www.researchgate.net/publication/281034931_The_Sandwich_Feedback_Method_not_very_tasty

Vroom, V. (1964). *Work and Motivation*. New York: Wiley.

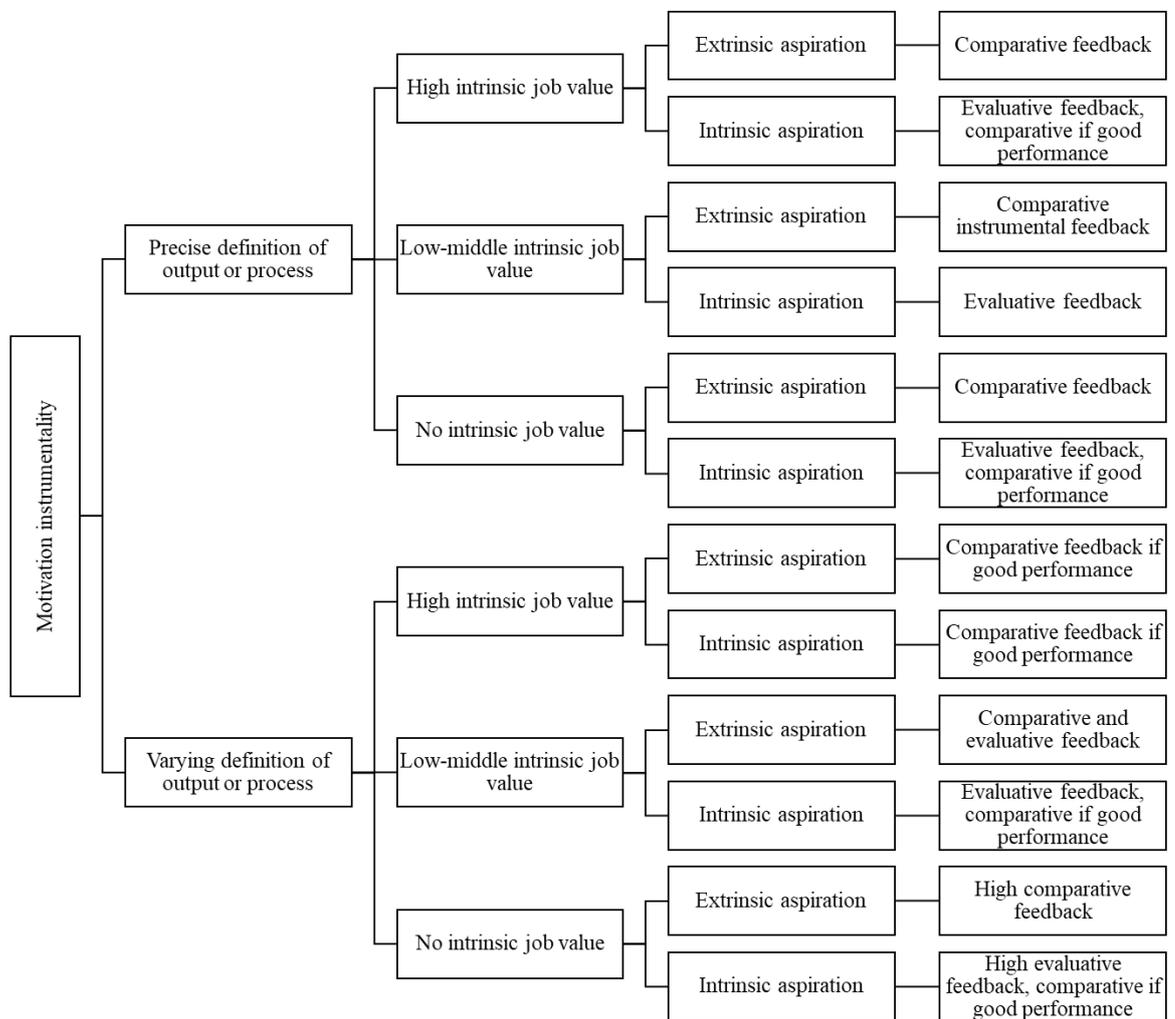
Wallace, E. R. (2006). Freud on "Mind"- "Body" II: Drive, Motivation, Meaning, History, and Freud's Psychological Heuristic. In E. R. Wallace, & J. Gach, *History of Psychiatry and*

- Medical Psychology* (pp. 757-779). Boston, MA: Springer.
doi:https://doi.org/login.bibproxy.whu.edu/10.1007/978-0-387-34708-0_26
- Wallace, E. R., & Gach, J. (2011). *History of Psychiatry and Medical Psychology: With an Epilogue on Psychiatry and the Mind-Body Relation*. New York: Springer Science & Business Media.
- Walsken, J. E., & Klein, P. V. (2018). Incentivizing Creative Disruption. 15-17. Vallendar.
- Watson, J. B. (1919). A schematic outline of the emotions. *Psychological Review*, 3(26), pp. 165-196. doi:10.1037/h0072509
- Watson, J. B. (1924). *Behaviorism*. New York: People's Institute Publishing Company.
- Watson, J. B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology*, 1(3), pp. 1-14. Retrieved from <http://psychclassics.yorku.ca/Watson/emotion.htm>
- Weibel, A., Rost, K., & Osterloh, M. (2010, April). Pay for Performance in the Public Sector—Benefits and (Hidden) Costs. *Journal of Public Administration Research and Theory*, 20(2), pp. 387-412. doi:10.1093/jopart/mup009
- Weiner, B. (1972, January). Attribution Theory, Achievement Motivation, and the Educational Process. *Review of Educational Research*, 42(2), pp. 203-215. doi:10.3102/00346543042002203
- Weiner, B. (1985). "Spontaneous" Causal Thinking. *Psychological Bulletin*, 97(1), pp. 74-84. doi:10.1037/0033-2909.97.1.74
- Weiner, B. (1986). *An Attribution Theory of Motivation and Emotion*. New York: Springer-Verlag.
- Weiner, B. (1991, September). Metaphors in Motivation and Attribution. *American Psychologist*, pp. 921-930. doi:10.1037/0003-066X.46.9.921
- Wener, K. M., Milyavskaya, M., Foxen-Craft, E., & Koestner, R. (2016, July). Some goals just feel easier: Self-concordance leads to goal progress through subjective ease, not effort. *Personality and Individual Differences*, 96, pp. 237-242. doi:10.1016/j.paid.2016.03.002

- Wenger, M. A. (1936, July). External Inhibition and Disinhibition Produced by Duplicate Stimuli. *The American Journal of Psychology*, 3(48), pp. 446-456. doi:10.2307/1415888
- Wherry, R. J. (1952). *The control of bias in ratings: VIII. A theory of rating*. PRB Report No. 922, Contract No. DA-49-083 OSA69. Department of the Army.
- Wherry, R. J., & Bartlett, C. J. (1982). The control of bias in ratings: A theory of rating. *Personnel Psychology*, 35(3), pp. 521-551. doi:10.1111/j.1744-6570.1982.tb02208.x
- White, R. W. (1959). Motivation Reconsidered: The Concept of Competence. *Psychological Review*, 66(5), pp. 297-333. doi:10.1037/h0040934
- Wigfield, A., Tonks, S., & Eccles, J. S. (2004). Expectancy - value theory in cross-cultural perspective. In D. McInerney, & S. Van Etten, *Research on Sociocultural Influences on Motivation and Learning volume 4: Big Theories Revisited*. Greenwich: Information Age Press.
- Wilde, M., Bätz, K., Kovalea, A., & Urhahne, D. (2009). Testing a short scale of intrinsic motivation. *Zeitschrift für Didaktik der Naturwissenschaften*, 15, pp. 31-45. doi:http://archiv.ipn.uni-kiel.de/zfdn/pdf/15_Wilde.pdf
- Womack, J. P., & Jones, D. T. (1996, January). *Lean thinking: Banish waste and create wealth in your corporation*. New York: Free Press, Simon & Schuster Inc.
- Woodworth, R. S. (1918). *Dynamic psychology*. New York: Columbia University Press. Retrieved from <https://archive.org/details/dynamicpsycholo00wood/page/n5/mode/2up>
- Woolley, K., & Fishbach, A. (2015). The experience matters more than you think: People value intrinsic incentives more inside than outside an activity. *Journal of Personality and Social Psychology*, 109(6), pp. 968-982. doi:10.1037/pspa0000035
- Wright, R. A., Tunstall, A. M., Williams, B. J., Goodwin, J. S., & Harmon-Jones, E. (1995). Social evaluation and cardiovascular response: An active coping approach. *Journal of Personality and Social Psychology*, 69(3), pp. 530-543. doi:10.1037/0022-3514.69.3.530
- Zichermann, G., & Linder, J. (2010). *Game-based marketing: Inspire customer loyalty through rewards, challenges, and contests*. Hoboken: Wiley.

Zwiebel, J. (1996). Dynamic Capital Structure under Managerial Entrenchment. *The American Economic Review*, 86(5), pp. 1197-1215.

APPENDIX



Appendix I Framework of Motivation Instrumentality

Appendices II-VI of the thesis are marked with a blocking notice.